Message from the ***Secretary***

Nuclear technology is a powerful technology. But not too many people understand its varied life-enhancing applications covering agriculture, environment, health and wellness, and industrial competitiveness.

In the preceding year, the management and staff of the Philippine Nuclear Research Institute diligently worked to bring out the benefits of radioisotopes and nuclear techniques in support of national development efforts.

Details within the pages of this 2010 Annual Report show that the hardworking men and women of PNRI continue to focus on the government's mission to improve the quality of life of Filipinos through purpose-driven research and development, nuclear related services, technology transfer, and implementation of nuclear regulations and safety practices. PNRI's activities in water resources management and marine ecosystem have been noted internationally.

We believe that nuclear technology will perform substantive development function that can expand its current range of application in food safety, environmental protection, health and wellness, medical products, and industrial productivity.

The Aquino government is committed to initiate, take on, and support S&T-based development initiatives that are inclusive, sustainable, and forward looking. Along this line, we look forward to new and innovative programs and applications to expand the boundaries of nuclear technology products and services in the country.

MARIO G. MONTEJO
Secretary

Message from the **Director**

On behalf of the officials, scientists, technologists and staff of the Philippine Nuclear Research Institute (PNRI), I have the honor to present the 2010 PNRI Annual Report.

The Grants-in-Aid assistance from the Department of Science and Technology (DOST) has enabled the PNRI to upgrade and expand the following facilities : PNRI Electrical Power Station, Radioisotope Laboratory, Nuclear Physics Laboratory, Radiation Chemistry Laboratory, Radioanalytical Laboratory, Radiation Protection Laboratory, and the Multipurpose Irradiation Facility. With these upgraded facilities, the PNRI is in a better position to undertake nuclear research and development, and deliver nuclear services.

The PNRI continues to apply radiation as a physical agent to induce changes in the structure and properties of materials resulting in the production of new products, new plant varieties, modified materials and safer food and food products. New non-food applications of irradiated carrageenan , a major natural resource of the country, are being explored, and putative mutants of rice, mungbean, soybean, cashew, mangosteen and ornamental plants are at various stages of screening for desired properties. Radiation processing of natural products, processed food and food products shows great potential for extending shelf life and ensuring food safety on a commercial scale. Further, the PNRI gives importance to environmental protection from the harmful effects of chemical and biological pollutants using nuclear techniques by identifying these pollutants , and understanding the processes that dictate their fate in the environment. The PNRI researches cover the air, ground and surface waters, and the coastal zone environments. As the Collaborating Center for Harmful Algal Bloom (HAB) studies of the International Atomic Energy Agency (IAEA), the PNRI continues to develop a field-based detection system that will provide a simple, rapid yet sensitive on-site detection of HAB toxins.

The PNRI has delivered specialized nuclear services and training courses which enabled clients and stakeholders to meet the standards required of their products and services as well as meet regulatory requirements for their activities and services. In fulfilling its mandate to ensure nuclear safety and security in the utilization of nuclear energy, the PNRI has dispensed its functions as the National Nuclear Regulatory Body with effectiveness and fairness. The technical capability of our nuclear regulators are honed through training and re-training , interactions with IAEA missions hosted by the PNRI, and participation in IAEA regional projects on nuclear safety.

International cooperation has been a defining factor in the development of nuclear S & T in the country. We were honored with the official visit to the Philippines in December 2010 of the IAEA Director-General Yukiya Amano . DG Amano committed the assistance of the IAEA that can contribute to national development and towards enhancement of the nuclear safety infrastructure of the country. The Philippines also undertakes international cooperation with the Forum for Nuclear Cooperation in Asia, and the Comprehensive Nuclear Test Ban Treaty Organization. 2010 marked the start of PNRI 's technical cooperation with the Institute for Radiation Protection (IRNS) of France and with the European Commission. The PNRI has sustained its collaboration with the US Department of Energy and the Australian Nuclear Science and Technology Organization in the area of nuclear security with the strong participation of national agencies involved in national security and border control.

The year 2010 was a time of transition from the old to the new structure under the PNRI Rationalization Program. The immediate impact of this change was the infusion of new and young professionals in the PNRI workforce which the PNRI welcomed as a positive development. A new generation of future nuclear scientists have been taken on board to carry the torch for PNRI's commitment to its mandated tasks of promoting the peaceful applications of nuclear energy and ensuring the safe and secure utilization of radioactive materials.

ALUMANDA M. DELA ROSA, Ph.D.
Director

Diffusion of ***Knowledge and Technologies***

The PNRI disseminated Information on nuclear energy and its beneficial applications to various stakeholders through the continuing conduct of training courses; implementation of information, education and communication activities; and through technology transfer of the Institute's marketable technologies.

NUCLEAR TRAINING

The Nuclear Training Center regularly holds training courses to continuously develop human resources with knowledge and skills on nuclear science and technology. The courses held this year consisted of the following: (1) two training courses for high school teachers and college/ university faculty; (2) one on radioisotope techniques; (3) 11 radiation safety courses on the use of nuclear equipment/devices, and on radiological health and safety for industrial radiographers; (4) eight training courses on nuclear power; and (5) a total of 23 on nondestructive testing (NDT) techniques. The courses on NDT were held in partnership with the Philippine Society for Nondestructive Testing (PSNT).

The Institute conducted a total of 50 training courses that were attended by 873 participants from various institutions. (See Appendices, Table 1, page 37 for list of PNRI training courses).

Practical training in nuclear science and technology in the high school and undergradute levels were also provided. Eighty three students underwent on-the-job training in the Institute's laboratories and facilities, while 18 students were provided thesis advisorship. (Please see Appendices, Table 2 on page 38).

INFORMATION SERVICES

To enhance the awareness, understanding and knowledge of different stakeholders on nuclear science and technology, the PNRI implemented various information, education and communication strategies.

Development of Information Materials

To complement the Institute's information dissemination efforts, the Information Services Group updated and developed print and non-print information materials.

The print information materials included the 2009 PNRI Annual Report and flyers on nuclear technology applications. Around 35,000 of the new and updated materials were distributed to about 15,000 clients. Exhibit banners (7 ft by 8 ft) were also produced with partial financial assistance from the DOST - Technology Application and Promotion Institute. The banners, which were displayed during science and technology fairs and other events, featured the following technologies: improvement of ornamental plants through gamma irradiation; isotope techniques in groundwater resources management and protection; nuclear technique for mineral exploration; and irradiation technology for the beekeeping industry.

A video presentation entitled "Enhancing Export Competitiveness of Philippine Mangoes Through Irradiation" was produced by the Agricultural Research Section in cooperation with the Information Services Group.

Educational Tours and Nuclear Awareness Seminars

Lecture-demonstrations, video showings and guided tours of PNRI facilities were the services provided to around 7,200 visitors, mainly students, during their educational trips at PNRI. Information assistance/service was also extended to 427 walk-in visitors and individuals with inquiries through phone and the PNRI website.

In cooperation with the Nuclear Training Center and PNRI technical staff, the Information Services Group conducted 17 nuclear awareness seminars for 11 high schools and colleges in Metro Manila. A total of 854 students, teachers and school administrators participated in the seminars.

Participation in Science and Technology (S & T) Events

Through participation in seven S & T fairs/events, the PNRI promoted and disseminated its nuclear and allied services and technologies to potential end-users and technology adoptors, among others.

These events were (1) Technicom-PCIERD's Investor's Forum and Exhibit at SM Megatrade Hall 3 on January 14; (2) Northern Luzon Cluster S & T Fair at Benguet State University on 15 - 16 February; (3) 1st Techno-Partnering Forum at the World Trade Center, Metro Manila on 22- 24 February ; (4) DOST Annual S & T Fair at Manila Hotel on 19 - 20 July; (5) 6th Northern Luzon Cluster S & T Fair at the University of La Salette-

Participants in the training course for high school and college faculty perform an experiment using a Geiger Muller counter.

Santiago City- Isabela; (6) Southern Luzon Cluster S & T Fair at the Puerto Princesa Sports Complex, Palawan; (7) Visayas Cluster S & T Fair at Robinson's Place in Dumaguete City on 28 - 30 September; (8) Mindanao Cluster S & T Fair at Limketkai Mall, Cagayan de Oro City, 8 - 10 October; and (9) 38th Atomic Energy Week at PNRI on 6 -10 December.

Media Publicity

The media have been a major conduit in information dissemination on nuclear science and technology to the public. This year, media releases were prepared and seven radio/television interviews of PNRI officials and staff as well as three media conferences were held. The topics that were discussed in the media interviews/ conferences were: (1) PNRI nuclear research and development activities and services; (2) nuclear energy for electricity generation; (3) 38th Atomic Energy Week Celebration; (4) nuclear science education,; and (5) international nuclear science and technology linkage and networking.

LIBRARY SERVICES

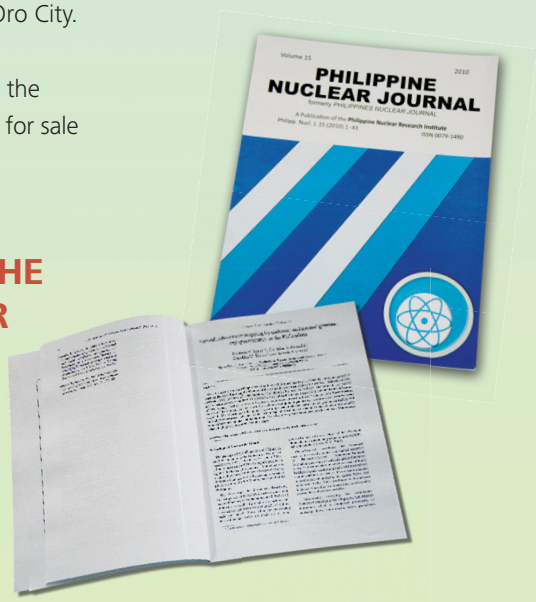
The Library Services Group continued to take part in library networking with the DOST Science and Technology Information System or SciNet (http://www.scinet.dost.gov.ph) and the Philippine eLibrary. Active participation in the International Nuclear Information System (INIS), operated by the International Atomic Energy Agency, was maintained. The INIS database consists of about three million bibliographic references on nuclear science and technology.

COMMERCIALIZATION OF PNRI-DEVELOPED MUTANT PLANTS

The PNRI-developed foliage mutant plants—*Murraya* 'Ibarra Santos', *Dracaena 'Marea'* and *Cordyline* 'Medina' were exhibited at the PNRI booth during the DOST Science and Technology (S & T) Fair at Manila Hotel and in regional cluster fairs held in Santiago City, Puerto Princesa City, Dumaguete City and Cagayan de Oro City.

The mutant plants were sold during the S & T fairs and were made available for sale to various clients at PNRI.

RE-LAUNCHING OF THE PHILIPPINE NUCLEAR JOURNAL (PNJ)



The country's sole technical publication on nuclear science and technology was relaunched in 2010 with a slightly changed name, from Philippines Nuclear Journal to Philippine Nuclear Journal. The 2010 issue contains five peer - reviewed papers on recent use and applications of nuclear science and technology in the Philippines.

Generation of **New Knowledge and Technologies**

The Institute continued to exploit the unique advantage of radiation and nuclear techniques in its research and development studies to help improve agricultural productivity, enhance health care and industrial operations, and protect the environment, among others.

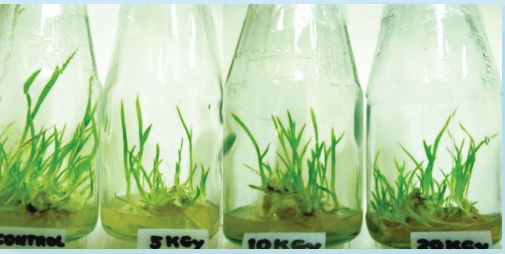
BASIC RESEARCH

Radiation Processed Materials from Carrageenan for Agricultural Applications

The Chemistry Research Section, in collaboration with the Agricultural Research Section, continued the studies on the potential use of carrageenan as antioxidant and as plant growth promoter.

Studies on Antioxidant Property of Kappa-Carrageenan - This year, the antioxidant property of refined kappa-carrageenan solutions irradiated at doses of 5, 10, 15 and 20 kGy and in solid form at 100 kGy were assessed.

The result showed that the antioxidant property increases as the radiation dose increases. Irradiation also degrades kappa-carrageenan into low molecular weight fragments or oligomers, leading to an



Spathoglottis plicata seedlings with oligo-carrageenan seven weeks after subculture of protocorms

Heavy metals adsorbed in silica glass (inset) are analyzed for trace element using total x-ray fluorescence spectrometry.

increase in the number of reducing sugars. These findings denote the potential use of irradiated kappa-carrageenan as a substitute for synthetic antioxidants utilized in food, pharmaceutical and cosmetic applications.

Effect of Kappa-Carrageenan on the In Vitro Germination of *Spathoglottis plicata* Seeds - The effect of irradiated and unirradiated (control) kappa-carrageenan on the in-vitro germination of *Spathoglottis plicata* seeds was also studied. Significant difference in the shoot length of the seedlings was observed in the control and kappa-carrageenan exposed to 20 kGy gamma radiation as compared to 5 kGy and 10 kGy. The longest root was observed at 20 kGy. These preliminary results indicate that irradiated aqueous kappa-carrageenan at 20 kGy can induce in-vitro germination of the seeds of *Spathoglottis* when used as a media component.

High Technology Materials Development

Research study on the metal adsorption properties of advanced materials is being undertaken by the Applied Physics Research Section for trace element analysis using the total reflection x-ray fluorescence spectrometry (TXRF). This year, the adsorption of ultra trace levels of heavy metals in water into large piece silica glass was studied. This material was used because of its capacity to adsorb dissolved heavy metals (such as lead) from water over the lighter ions. The study is intended to provide an alternative to the use of high-surface area silica sorbent which requires complex recovery procedure of the adsorbed ions before analysis can be performed.
The preliminary results of the study showed that the selective adsorption of heavy metals by silica makes eliminating the light element matrix significantly easier. The direct surface analysis of the adsorbed ions allowed the determination of the heavy metals, such as lead in water samples, down to a concentration level below one part per billion.

Neutron Beam Applications Using Small Neutron Sources

The Applied Physics Research Section started to test the capability of the prompt-gamma neutron activation analysis (PGNAA) facility for determining the presence and amount of several elements simultaneously in small amount of samples.

PGNAA – a nuclear technique - entails the continuous irradiation of the sample with a beam of neutrons and emission of prompt gamma rays which are measured with a gamma ray spectrometer. The gamma rays identify the neutron-capturing elements, while the intensities of the peaks at these energies reveal their concentrations.

The technique is appropriate for the analysis of biological and geological samples, various hydrogen storage materials and battery materials.

Set-up of the prompt -gamma neutron activation analysis facility consisting of a neutron source, sample chamber and high purity germanium detector.

Ion beam-irradiated rice seeds are grown at the PNRI experimental field for further evaluation.

NUCLEAR APPLICATIONS IN FOOD AND AGRICULTURE

Crop Improvement Through Radiation-Induced Mutation

Rice

Studies on improving the agronomic traits and the amylose and protein contents of rice using gamma and ion beam irradiations showed that the fifth generation (M_5) of plants irradiated with 200 and 300 Gy gamma radiation flowered one week earlier as compared with the control variety.

Plants irradiated with 20 Gy ion beam in Japan and planted at PNRI also flowered one week earlier than the control and the check variety IR64.

The protein content of rice irradiated at 200 and 300 Gy were found to be higher than the control (6.25 percent to 7.88 percent). The protein content at 200 Gy ranged from 8.12 percent to 11.44 percent while at 300 Gy, a range of 8.0 percent to 8.62 percent was obtained.

Analysis of the amylose content of plants irradiated with 200 Gy showed that eight out of the 109 plants analyzed have low to intermediate amylose content compared to the six out of 124 plants for those treated with 300 Gy. Rice that have low to intermediate amylose content have good eating quality.

Mungbean

Five high-yielding varieties of mungbean previously irradiated with doses of 200, 400, 600 and 800 Gy gamma radiation were planted at the PNRI experimental field for evaluation of their protein content.
The irradiated varieties, which were obtained from other countries, consisted of Psj-B-II-17-6, VC 2917A, KPS 2, and NM51 x VC1973A and Psj -S-31. The local variety, NSIC Mg 11, served as the control.

A high percentage of germination and survival was observed in all the irradiated varieties, including the control. There were no changes in the number of days to flower in all the varieties. Results also showed that gamma irradiation significantly affected the agronomic traits of the varieties NM51 x VC1973A and Psj-B11-176. There was no significant effect observed in the irradiated and unirradiated plants of Psj-S-31 variety.

Drought tolerant plants of PSB-Sy4 one month without watering

Under the PNRI Grants-in Aid project, the Bureau of Soils and Water Management carried out a research study on the same mungbean varieties to evaluate mungbean mutants that are tolerant to acid soil conditions. The varieties were planted in Tanay, Rizal for the M_1 or first generation.

Soybean

Research on soybeans to improve their agronomic characteristics and to select drought tolerant mutants is ongoing at PNRI. This year, drought-tolerant plants selected from irradiated soybean varieties from Vietnam (AKO-6, DT-95 and DT-84) and the Philippines (PSB-SY 4, PSB-SY 5 and BPI-SY4) were planted in the PNRI screenhouse. Further selection and evaluation of drought tolerant mutants were done after watering was stopped one month after planting. Data obtained on the ninth (M_9) and tenth (M_{10}) generation

A study on the evaluation of mungbean mutants that are tolerant to acid conditions in Tanay, Rizal is being conducted by the Bureau of Soils and Water Management under the PNRI-Grants-in-Aid program.

planting showed that PSB- Sy 5 variety was the tallest but it took longer to flower. The PSB-Sy 4 variety irradiated with 250 Gy had the highest 100-seed weight in grams, with 21.1 grams followed by the control of the same variety with 20.8 grams.

Further evaluation and confirmation of selected drought tolerant plants were also done by planting these in pots inside the PNRI screenhouse. As in the field experiments, watering was stopped one month after planting. The pot experiments showed that the varieties from Vietnam flowered earlier as compared to the local varieties in both the control (unirradiated) and the irradiated plants. The local varieties—PSB-Sy 4 and BPI-Sy 4—flowered one week earlier than PSB-Sy 5. Drought-tolerant plants were selected from all irradiated varieties. However, the harvested seeds were thin and not uniform in size.

Cashew plants treated with 300 Gy had the biggest fruit and seed.

Cashew and Mangosteen

Mutation breeding studies on these tropical fruits were pursued to develop the following qualities: increased yield, improved quality, short stature to facilitae harvesting, early maturity and non-seasonal fruiit production.

Cashew - Fifty irradiated cashew plants from the first generation (M_1) were maintained at the PNRI experimental field. Initial observations showed that almost 90 percent of the plants flowered and 60 percent of these bore fruits at different periods. Flowers developed early from irradiated plants as compared to the unirradiated or the control. The control plants had the highest average number of fruits per plant followed by those treated with 200 Gy dose of gamma radiation. The plants treated with 100 Gy had the most number of fruits harvested while those treated with 400 Gy had the lowest number of fruits. Plants treated with 300 Gy had the biggest fruit and seed. The fruits of irradiated plants were sweet to semi-sweet as compared with the control. Fruits of both the irradiated and the control were juicy.

Mangosteen - A total of 290 M_1 mangosteen plants (series A-E) were maintained in the PNRI experimental field and at the screenhouse. The plants were obtained from both unirradiated seeds and those irradiated with gamma radiation ranging from 5 Gy to 40 Gy. Initial observation of Series A plants showed dwarfism in those treated with 20 Gy while the plants treated with 5 Gy were the tallest. All seeds treated with 5, 20, 30 and 40 Gy had 100 percent plant survival as compared with seeds treated with 10 Gy and the control plants.

A total of 54 in-vitro cultured plantlets were grown and maintained at the screenhouse. Parallel in-vivo planting was done using seeds from fruits obtained from Lucban, Quezon. The seeds were planted in seed boxes as whole and half cotyledons after treatment with gamma radiation doses of 10, 20, 30, 40 and 50 Gy. Initial observation showed that the most number of seedlings germinated in the control or unirradiated seeds and in seeds irradiated with 10 Gy. No germination was observed in seeds irradiated with 50 Gy.

In-vitro cultured mangosteen plantlets being maintained at the PNRI Tissue Culture laboratory

ORNAMENTALS

New or improved varieties of selected ornamental crops–*Spathoglottis* orchids, foliage-type anthuriums and Hoyas--are likewise being developed at PNRI through gamma irradiation.

Foliage Ornamentals

A new putative mutant derived from the existing *Murraya* 'Ibarra Santos' is being propagated. This has small and clustered leaves and flower and is also sterile or does not produce seeds. (Note: *Murraya* 'Ibarra Santos' is the mutant plant. There are at least three putative mutants of *Murraya* 'Ibarra Santos')

Putative mutant from Murraya 'Ibarra Santos'

A new putative mutant of *Dracaena* 'Marea' - which has very dark green leaves with broad white stripe at the middle - was isolated and propagated in three individual pots for further evaluation.

Hoyas

The PNRI germplasm collection has increased its living accessions of Hoya, from 95 in the previous year (2009) to 153 as of December 31, 2010. This collection has 51 identified native species, 20 unknown native species and 17 imported species. Seven of the 20 unknown native species are probably unidentified or new to science.

Putative mutants from Dracaena 'Marea'

Dracaena 'Marea'

Spathoglottis Orchids

PNRI researchers have established the time and technique for collecting root tip samples of *Spathoglottis* for cytological works and have determined the mitotic chromosome numbers (2n) of six species and hybrids. This knowledge is important in breeding or varietal development.

The Institute filed the application for patenting of the technology entitled "Embryo Culture Medium Composition for *Spathoglottis* and Other Orchids" . The PNRI also submitted to the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) for evaluation the disclosure "Procedure for Karyotyping Mitotic Chromosomes of *Spathoglottis* and Other Orchids".

Additional putative mutants were obtained and are being evaluated for generation advancement. The putative mutants include the following: *Hoya buotii, H. crassicaulis*, *H. multiflora* and *H. pimenteliana* with variegated leaves, *H. cumingiana* with dwarf stature and smaller leaves, *H. lacunosa* with purplish pigmentation and smaller leaves and *H. lacunosa* with purplish pigmentation on the leaf undersurface. The putative mutant *H. mindorensis* is at the first mutation generation and fifth vegetative generation (M_1V_5), H. obscura is at M_1V_6, while *H. siariae* is at M_1V_5. These selections differed from the control and original plants in their flower color.

One of the putative mutants of Hoya .

Variegated Hoya buotii mutant

Control Hoya buotii

Putative Hoya siariae mutant

Control Hoya siariae

By storing the glass container with *H. buotii* seeds in the refrigerator, the viability of these seeds was extended for two months (98 percent germination). At three - to four - months of storage, germination of the seeds dropped to 28 to 31 percent while at five to six months, there was at most 11 percent germination. This seed technology maximizes storage time for growers to collect Hoya seeds while ensuring survival of the embryos or optimizing seed germination.

New Mutant Varieties for Possible Registration

Four new mutant ornamental plant varieties were developed and prepared for registration with the National Seed Industry Council.

Fifty plants of one variety, the chlorophyll mutant *Dracaena sanderiana var. virescens,* were propagated to meet the minimum number for registration. This will be registered as *Dracaena* 'Sun Beam'. It is ideal as a landscaping material under diffused light condition, as potted plant for indoor use, and as cut foliage.

The other mutant varieties that will be propagated are: (1) "Bagauak na Puti/ Itim" (*Clerodendrum calamitosum*) that is semi-dwarf and bears fragrant, long-lasting white flowers both at the shoot tips and at the leaf axils; (2) Creeping basket plant (*Callisia repens*) with longer, purplish internodes and larger leaves; and (3) *Acalypha* 'Brownie' with large, greenish brown leaves of different shapes (instead of small coppery leaves) that turn bright red depending on the light intensity and temperature.

Quarantine Treatment of Mango Pulp Weevil in Philippine Carabao Mangoes

The research project on determining the dose needed for mango pulp weevil, *Sternochetus frigidus* (Fabricius), to be able to achieve quarantine security was completed by PNRI in collaboration with the Bureau of Plant Industry-Department of Agriculture. The project involved data collection on the dose response tests and small-scale confirmatory tests. The dose-response tests used different developmental stages of mango pulp weevil such as larva, pupa and adult while the confirmatory tests used the stage found most tolerant to radiation.

Results of the small-scale confirmatory tests showed that mango pulp weevil adults irradiated with a target dose of 150 Gy gamma radiation did not lay eggs in all the three replications. The results validated previous findings

Separation of sexes of irradiated and unirradiated mango pulp weevil under a photomicroscope

Characterization of labeled conotoxin by high performance liquid chromatography and receptor binding assay

in the dose response tests. The maximum absorbed dose received by the mango pulp weevil adults will become the minimum dose for quarantine treatment.

A project report will be submitted to the United States Department of Agriculture -Animal and Plant Health Inspection Service-Center for Plant Health Science and Technology to request approval of the established dose for quarantine treatment of mango pulp weevil in Philippine Carabao mango to enable our country to export our mangoes to the United States.

HEALTH AND MEDICINE

Application of Nuclear Techniques in Harmful Algal Bloom Studies

Field Detection System for Monitoring Paralytic Shellfish Toxins

As part of its role as an IAEA Collaborating Center in Harmful Algal Bloom (HAB) Studies, the PNRI has been conducting research studies on understanding and managing HAB (red tide) in the country. The studies involved the application of receptor binding assay (RBA), a laboratory –based technique, for measuring the toxicity of shellfish during the occurrence of HAB and for regular monitoring of shellfish to prevent cases of paralytic shellfish poisoning (PSP).

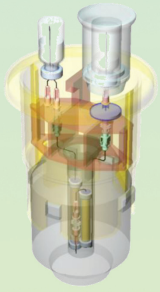
A radioactive tracer (tritiated saxitoxin) is currently being used by PNRI for RBA.

To ensure the routine application of RBA, the Chemistry Research Section continued to work on establishing the protocol for the production of a novel radioligand as an alternative to the currently used imported and unstable tritium-labeled reagent for RBA.

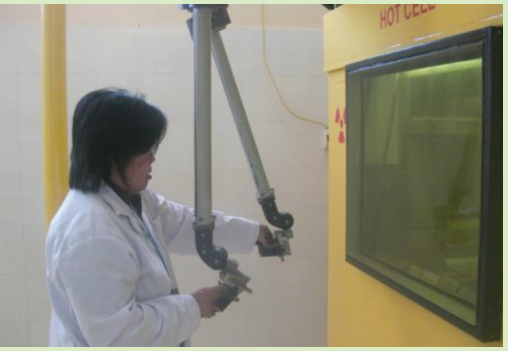
The Section also worked on developing a new field-based RBA test kit that will provide a simple, rapid, and on-site (field-based) quantitative detection of PSP toxins.

Presently, there is no other quantitative method that can be easily used in the field to immediately assess sample toxicities. The field detection approach will prevent extended delays in the analyses of samples. Early toxin detection will directly aid monitoring agencies in the effective management of PSP.

Interiors of a Tc-99m generator



Example of a Tc-99m generator



A PNRI science research specialist learns how to manipulate controls in a hot cell facility for Tc99m generators production facility at Dhalat Nuclear Research Institute in Vietnam.

Facility for the Production of Molybdenum-99/Technetium-99M Generators

The PNRI has started the setting up of the facility for the production of Molybdenum-99/ Technetium-99m (^{99}Mo- ^{99m}Tc) generators. Technetium-99m, a medical radioisotope, is imported to the Philippines in the form of ^{99}Mo-^{99m}Tc generators. The Tc-99m, which makes up for about 80 percent of nuclear medicine procedures, is widely used in nuclear medicine for imaging and scanning of various organs in the body (such as the brain, lungs, kidneys, liver, thyroid and bone) and in the diagnosis of metabolic disorders.

With the establishment of the facility in the Philippines, PNRI aims to provide low-cost Technetium-99m radionuclide to hospitals and to help make available radiopharmaceuticals for research and clinical nuclear medicine.

Production of PVP-carrageenan hydrogels at PNRI for market acceptability testing

RADIATION TECHNOLOGY AND PROCESSING

Semi-Commercialization of PVP Carageenan Hydrogels for Burn, Wound and Bed Sores

The Phase 3 of the stability testing and technology transfer of this DOST-Technology Innovation and Commercialization (TECHNICOM) Project started this year.

For the implementation of this project, PNRI established partnership with Biotecos and Lloyds laboratories Inc. in Malolos, Bulacan for the market acceptability testing and manufacture of the PNRI-produced hydrogels. The sterility testing will be carried out according to the standard protocol ISO 11137-2 "Sterilization of Health Care Products - Radiation – Part 2 - Establishing the Sterilization Dose." A License to Operate as well as the product registration from the Department of Health will be secured as part of the joint undertaking. After the completion of the stability testing, a Memorandum of Agreement will be forged between PNRI and the two companies.

Microbial counting of irradiated and unirradiated tomato sauce

Food Irradiation Technology

To reduce the microbial load of vacuum-packed lettuce and packed tomato sauce, the PNRI worked with two multinational companies on the irradiation of these products. It was found that exposure to a gamma radiation dose of 1 kGy was effective in reducing the microbial load of vacuum-packed lettuce to an acceptable level. At this dose, the integrity of packaging used was retained and was comparable to the control (unirradiated) upon storage.

For the packed tomato sauce, irradiation was done at doses of 3, 6 and 9 kGy. Microbiological and sensory evaluations were conducted on both irradiated and unirradiated tomato sauce . Results showed that there was no increase in total microbial load in irradiated sauce stored for five months at ambient conditions. There was also no significant difference in color, odor and flavor of irradiated sauce as compared to unirradiated sauce.

Through awareness seminars, the PNRI continued to provide various industry sectors with information on the status of food irradiation technology in the country.

ENVIRONMENTAL PROTECTION AND MANAGEMENT

Assessment of Radiological Impact of Human Activities on the Marine Environment in the Philippines

This project aims to measure the specific activity concentrations of natural and anthropogenic radionuclides in marine samples and make dose assessments of exposure to population due to consumption of seafoods.

This year, samples consisting of seawater, bottom sediments, biota and seaweeds were collected from Batanes, Davao and Palawan. Using gamma ray spectrometry, the Health Physics Research Section measured the specific activity concentrations of key anthropogenic radionuclide cesium-137 and the naturally-

occurring radionuclides radon-226 in seawater, sediment and biota, as well as thorium-232 and potassium-40.

Analysis of polonium-210 in samples was also done by alpha spectrometry. Dose assessment results showed that the radionuclide activity concentrations in the marine samples were low and posed no significant health effects.

PNRI Environmental Radioactivity Monitoring

The Health Physics Research Section measured the ambient gamma radiation weekly in five locations/sampling points inside the PNRI compound using the Surveillance and Measurement-935 portable gamma spectroscopy system. The mean gamma radiation dose rates observed in PNRI grounds are within the nationwide background radiation level with values ranging from 21 to 124 nanosieverts per hour.

Collection of environmental samples, such as topsoil and grass, from each station and analysis of these samples for naturally-occurring radionuclides will start in 2011.

As part of PNRI's environmental surveillance program, ambient gamma radiation monitoring was also conducted in the vicinities of Batanes, Davao, Palawan, and Calaca coal-fired power plant in Batangas. The ambient gamma dose rates measured in these areas were generally within the natural background radiation level observed in the Philippines.

Management of the Comprehensive Nuclear Test Ban Treaty Organization (CTBTO) Stations in the Philippines

The Institute continuously managed the daily operation (24/7) and maintenance of the RN52 radionuclide monitoring station in Tanay, Rizal and the National Data Center (NDC-PH) at PNRI. The RN52 and NDC-PH are part of the International Monitoring System (IMS) of the Vienna- based Comprehensive Nuclear -Test -Ban Treaty Organization (CTBTO) for global monitoring of radiation released in the environment (such as from nuclear explosions and accidents).

As in previous years, spectral and meteorological data and all communications between the RN52 station and the CTBTO were transmitted directly to the International Data Center in Vienna, Austria via the global communication infrastructure network. Monthly reports

The CTBTO radionuclide monitoring station in Tanay, Rizal is maintained and operated by PNRI (right photo) Replacement of air filters at CTBTO monitoring station (left photo)

Ambient gamma dose rate measurement at the coal-fired power plant in Calaca, Batangas

were also submitted to the CTBTO IMS headquarters as specified in the contract for Post-Certification Activities for CTBTO RN52 radionuclide station. The air filter samples gathered at the RN52 station were sent quarterly to the IMS headquarters for analysis and archival.

The data on radionuclide activity concentrations in air particulates measured from the air filters at the RN52 radionuclide monitoring stations were obtained from the the International Data Center in Vienna through the NDC-PH based at PNRI. This year, only berylium-7 and lead-212 were the gamma-emitting natural radionuclides detected and measured. No artificial radionuclide was detected throughout the entire year.

Radiological Assessment of NORM and TENORM in the Philippine Environment

The radiological effects of technologically-enhanced radioactive materials (TENORM) are being studied by PNRI.

This year, the Health Physics Research Section collected samples consisting of raw coal, ash, bottom ash and effluent from the Calaca coal–fired power plant in Batangas. Top soil samples were also collected inside the Calaca power plant and in the surrounding barangays within the municipality. The processed samples from the Calaca power plant will be analyzed by gamma spectrometry on the first quarter of 2011 to determine the activity concentrations of K-40, Th-232, Rn-226 and Cs-137. Ambient gamma radiation measurements were also performed at the plant site. Results showed that radiation levels were within normal levels.

Radon Monitoring of the Valley Fault System

PNRI continued its work on the establishment of baseline radon data that can be utilized in the study and monitoring of possible seismic activity. The monitoring involved mainly measurements of radon (a naturally-occurring radioactive gas) in soil in 18 established monitoring stations at the Valley Fault Sytem.

Results of measurements of the sub-surface soil gas concentrations using RDA-200 and RAD-7 radon monitors

Radon measurements within the boundary of Rodriguez town (formerly Montalban) and Quezon City.

Analysis of ^{18}O and ^{2}H in water samples using Isotope Ratio Mass Spectrometry.

showed no significant increases in radon measurements, indicating normal conditions.

ISOTOPE TECHNIQUES FOR WATER RESOURCES MANAGEMENT AND PROTECTION

Verifying Recharge Process in Groundwater Systems

To study the interactions of groundwater and surface water, PNRI applies isotope ratio mass spectrometry and tritium measurements combined with hydro chemical techniques.

Through these techniques, PNRI was able to obtain information about the mechanism of recharge to ground water systems, river or sea water intrusion in an aquifer, and infiltration of contaminated leachate from municipal landfills into the groundwater.

Studies conducted on the groundwater system in Bulacan province were useful in identifying the source of salinity of the groundwater and in assessing the vulnerability of the aquifers to contamination.

Sediment core sampling in Sorsogon Bay

Historical Sedimentation Rate and Radiometric Fingerprinting of Suspended-Sediment in Selected HAB Areas

Alpha counting of sediment core samples at PNRI.

The project involves the use of isotopic and nuclear techniques to provide a historical perspective of nutrients and other contaminants in marine sediments in identified study areas in Sorsogon - a harmful algal bloom (HAB) affected area. It also includes the application of radiometric methods, coupled with physical and chemical analyses, to identify the possible sources of suspended sediment- associated nutrients in Sorsogon bay.

To obtain information/data on the history of the input of contaminants into the bay, the Chemistry Research Section collected and analyzed sediment core samples for analysis of heavy metals, carbon and nitrogen isotopic composition. Results showed a sedimentation rate of about one centimeter per year .

A soil sampling strategy was also employed to determine possible sources of suspended sediments in the study area. The samples were classified into type and land use and then analyzed for their relative contributions (sediment fingerprinting) to the suspended sediments flowing into the bay. Possible fingerprint properties analyzed include the following elements: isotopic (cesium-137 and nitrogen-15), radiometric (lead-210, cesium-137, potassium-40), heavy metals (copper, zinc, iron), organic (carbon and phosphorus), and base cations (calcium, potassium, magnesium, sodium).

Source Identification and Apportionment of Air Particulate Pollution

The PNRI continued to collect air samples from four sampling sites in Metro Manila using the Gent dichotomous air samplers. The air particulates collected were analyzed for elemental content by nuclear analytical and related techniques such as x-ray fluorescence spectrometry and photon-induced x-ray emission spectrometry to monitor air particulate matter both in the $PM_{2.5}$ and $PM_{2.5-10}$ range.

The four sampling sites are the Ateneo de Manila University (ADMU) in Quezon City which is being maintained by PNRI in collaboration with the Australian Nuclear Science and Technology Organization; Valenzuela City; POVEDA Learning Center in Pasig City; and NAMRIA in Taguig City. Studies at the last two monitoring stations were funded under the Air Quality Management Fund of the Environmental Management Bureau from July 2009 to July 2010.

Collection of soil samples at Didipio, Nueva Viscaya for multi-element analysis at PNRI and in-situ measurement of potassium, uranium, thorium using gamma ray spectrometer.

Results for 2010 showed that the PM_{10} mean levels for NAMRIA, POVEDA and Valenzuela sampling sites have remained in compliance to the Philippine National Ambient Air Quality (PNAAQ) long term-guideline value of 60ug/m^3 but $PM_{2.5}$ mean levels are in exceedance of the World Health Organization long-term guideline value of 10µg/m^3. The levels show that, especially based on the $PM_{2.5}$ levels, more concentrated effort in the implementation of the Clean Air Act is needed in order to clear up our air. Source apportionment studies show traffic-oriented sources make up a large portion (up to 72 percent) of the air pollutant sources. This observation suggests that focus on the reduction or improvement of traffic-oriented activities would greatly reduce air pollutants resulting to an extensive improvement in air quality.

The studies on source apportionment has been successfully promoted by PNRI to end-users especially to the Environmental Management Bureau. With the involvement of PNRI in the IAEA/RCA air pollution studies, data from the ADMU stations have contributed to the regional database for use of stakeholders and end-users.

NUCLEAR APPLICATIONS IN INDUSTRY

Characterization of Natural Radioelement Signatures of Porphyry Copper-Gold Deposits

A total of 340 soil samples out of the 442 samples collected from Didipio, Nueva Vizcaya were analyzed for copper, lead and manganese by atomic absorption spectrophotometry. The results indicated that copper values ranged from 30.57 to 3726.24 parts per million (ppm); lead values ranged from 22.54 to 99.14 ppm and manganese values ranged from 101.87 to 2225.50 ppm. The high copper values coincide with the known Dinkidi copper-gold deposit. Analyses of the remaining samples will be done in 2011.

Recovery of Rare Earth Elements and Nuclear Materials

Several allanite samples were fused with potassium bisulfate using the furnace at 600^0 C, 650^{0}C and 750^{0}C for 45 minutes. Fused samples were treated with sulfuric acid (H_2SO_4) and sodium hydroxide (NaOH). The suspension was filtered and the precipitate was dissolved in minimum amount of nitric acid (HNO_3). Using the X-ray fluorescence spectrometer (XRF), samples fused at 650^{0}C were found to have a greater yield of rare earth elements (REE). Further verification will be done to validate this result.

ENERGY

Nuclear Power Program

In line with the government directive in 2009 to study the nuclear option including the possible rehabilitation of the Bataan Nuclear Power Plant (BNPP), the Department of Energy (DOE) and Department of Science and Technology (DOST) created jointly in 2009 an inter-agency Core Group on Nuclear Energy. As a member of the Core Group, the DOST-PNRI has been actively participating in the various activities of the Group which is composed also of the National Power Corporation (NPC) and DOST agencies, namely, the Science and Technology Information Institute (STII), Philippine Council for Industry and Energy Research and Development , PAGASA and PHIVOLCS.

Human Resources Development

This year, the DOST, through PNRI, conducted a series of training courses on nuclear power participated in by around 164 technical personnel from NPC, DOE and PNRI (see Appendices, page 37, for list of courses).

Participants of the "Stakeholder Communication Workshop on Nuclear Energy with IAEA experts /lecturers.

Public Information and Consultation

Nuclear Energy Information, Education and Communication Activity. The DOST, through PNRI and STII, participated in the development of a public perception survey on nuclear energy for power generation as a long-term option in the Philippines. The survey was conducted in ten cities nationwide during the Philippine Energy Plan/ Nuclear Energy Information, Education and Communication (IEC) campaign of DOE and the Public Information and Consultation Team of the Inter-agency Core Group on Nuclear Energy. The nuclear IEC topics covered the applications of nuclear technology in the Philippines; nuclear safety and regulations, and nuclear energy for power generation.

Communication Plan Workshop. The PNRI coordinated the conduct of a three -day International Atomic Energy Agency (IAEA) "Stakeholder Communication Workshop on Nuclear Energy" in May 2010 for 40 members of the Inter-agency Core Group on Nuclear Energy at the NPC Training Center in Bagac, Bataan. Three IAEA experts on nuclear communication were the resource persons during the workshop. A stakeholder communication plan structure was prepared as output of the IAEA workshop participants.

Seminar on Nuclear Energy. *The Institute also took an active part in the* Media Orientation Seminar and Visit to the Bataan Nuclear Power Plant (BNPP-1) for 25 science and technology reporters / editors representing print, radio and cyber media. The seminar consisted of lectures on nuclear technology applications in the Philippines and on nuclear energy for power generation.

Provision of **Quality Nuclear S & T Services**

The Institute makes available special nuclear and allied services to different sectors, such as in industry, business, health, government and the academe to disseminate to the Filipino public the benefits of the peaceful uses of nuclear technology.

RADIATION PROTECTION SERVICES

The Institute provided radiation exposure monitoring services to different sectors—such as workers who are occupationally exposed to radiation, to licensed users of radioactive materials, and to the public upon request. This is aimed at preventing unnecessary exposure to ionizing radiation.

Personnel Monitoring Service. The PNRI monitored and assessed the radiation dose received by workers who are occupationally exposed to external sources of ionizing radiation through film badge

The new storage transfer system of the irradiator inside the Multipurpose Irradiation Facility at PNRI.

A rack containing thermoluminiscent (TLD) cards is placed inside the TLD reader for processing.

and thermoluminiscent dosimeter (TLD) personnel monitoring services.

Secondary Standards Dosimetry Laboratory (SSDL) Calibration

The services extended through the SSDL were: (1) calibration and standardization of radiation monitoring instruments and dosimeters to ensure accurate radiation measurements; and (2) dose output calibration of brachytherapy, teletherapy and dose calibration equipment in hospitals.

Radiation Control and Hazards Evaluation

To make sure the work areas and the operation/condition of radiation-emitting devices in authorized facilities in the country are in accordance with national radiation safety standards, the PNRI continued to extend services such as: (1) leak testing of sealed radioactive sources; (2) rental of radiation detection instruments such as survey meter; (3) radioactivity analysis of swipe samples; and (4) area monitoring.

Radioactive Waste Management

The PNRI maintains an interim National Radioactive Waste Management Facility at the Institute's compound for use in the proper and safe management of disused radioactive sources generated by licensed users of radioactive materials in the country.

GAMMA IRRADIATION SERVICES

As in previous years, PNRI provided irradiation services to various clients using the Gammacell 220 for small volume of samples and the Multipurpose Irradiation Facility (MIF) for bulk irradiation. The process involved the exposure of samples to a predetermined dose of gamma radiation from a cobalt-60 source to obtain a desired objective.

At the Gammacell-220, a total of 1,150 samples from 90 clients (mostly from the government sector) were irradiated for mutation breeding and research purposes. The samples included seeds, tissue culture, plant parts, fruit fly pupae and mice.

At the Multipurpose Irradiation Facility (MIF), a total of 23,901 products/samples were irradiated for sterilization, decontamination and for research purposes.

The products, which were irradiated for 43 clients (mostly from the industrial sector), consisted mainly of food, medical, pharmaceutical and cosmetic items.

To accommodate the increasing number of products for irradiation, the PNRI upgraded the MIF under the DOST Grants-in-Aid Project on Upgrading of Facilities. The project

RADIATION PROTECTION SERVICES * 2010		
National film badge service	9,300 clients	3,000 institutions
Thermoluminescent dosimetry monitoring service	1,750 clients	115 institutions
Calibration of radiation detection instruments (survey meters)	530 units	33
Calibration of radiation detection instruments (pen dosimeters)	366 units	30
Leak testing of sealed sources	342 sources	124
Management of spent sealed sources	3 units	2
Management of solid wastes	5 cubic meters	3
Output calibration of teletherapy and brachytherapy sources	17 units	5 clients

Gammametric analysis of food and related samples

A Computer Services staff demonstrates the use of Account Information System for film badge and TLD to Radiation Protection Services staff

Microscopy of prepared samples for chromosome aberration analysis

covered the expansion of the storage area of the MIF for both irradiated and unirradiated products as well as the relocation of the storage transfer system of the irradiator to the new expanded facility.

NUCLEAR-BASED ANALYTICAL SERVICES

The Analytical Measurements and Services Section analyzed 219 samples submitted by 66 customers from the academe, research, industry and business sectors. These analyses were required either for regulatory purposes, for non-radioactivity certification of products prior to trading and export; and for research.

The services extended included four procedures, the first two being ISO/IEC 17025:2005 accredited procedures: (1) gross-alpha beta analysis of drinking water and well water samples by liquid scintillation counting; (2) gammametric analysis of food and foodstuff and related samples; (3) multi-element analysis of samples of food, mine tailing, glass slide, ore sample, and air filter; and (4) detection of acetic acid adulteration in vinegar by carbon-14 assay.

COMPUTER SERVICES

Using Microsoft Access, the Computer Services developed the account information systems for film badge and thermoluminiscent dosimeters (TLD) which are used for personnel monitoring of exposure to ionizing radiation. The systems keep track of the film badge and TLD clients and accounts, compute doses and generate reports.

The Group also carried out the following: (1) programmed a training participants database system for the PNRI Nuclear Training Center; (2) acquired an Intranet Personnel Information System from the Advanced Science and Technology Institute and tailored/customized it into the PNRI Personnel Information system (INFOSYS) which is due for testing and implementation in the first half of 2011; (3) replaced the old e-mail system with Zimbra, an open source e-mail system which has better functionalities and features; (4) maintained and improved both hardware and software of the Institute's computer network, the website and the Content Management System; and (5) assisted the Institute's personnel in solving sundry computer hardware, software and network issues.

ENGINEERING SERVICES

The services which were provided to PNRI and non-PNRI clients include: (1) assistance in the design, fabrication and installation of radiation handling facilities, equipment and devices; (2) development, design, fabrication, repair and maintenance of radiation detection and measuring instruments; (3) conduct of training in nuclear instrumentation, non-destructive testing and other nuclear-related engineering techniques; and (4) active participation in international or inter-agency activities or projects aimed at enhancing the development of support/technical industries for the nuclear technology sector.

CYTOGENETIC COUNSELLING

This service, which involved chromosomal analysis of blood samples, was availed of by 47 individuals for the following: (1) determination of levels of radiation exposures of 43 workers who work in a radiation facility abroad; and (2) confirmation of the existence or absence of genetic disorders such as Downs Syndrome and genetic sex (presence of X or Y chromosomes).

Ensuring the **Safety and Security of Radioactive Sources**

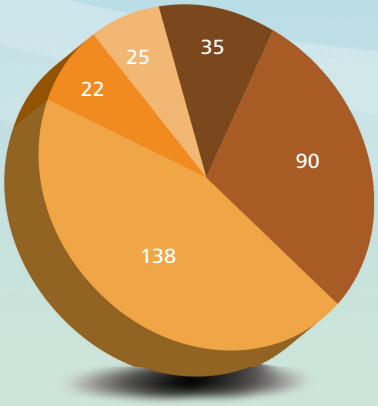
The PNRI is mandated by law to promulgate and enforce nuclear regulations to ensure that radioactive materials in the country are used safely and solely for peaceful applications. Thus, its programs and projects ascertain that regulatory policies and guidelines are implemented properly.

STANDARDS DEVELOPMENT

To strengthen the PNRI's nuclear regulatory framework and to ensure that the safety and security requirements in the use of nuclear materials conform to international guidelines, the Standards Development Section (SDS) continued to develop/update regulations, standards, guides and to issue orders and bulletins, as necessary. This year, three Codes of PNRI Regulations (CPRs) and one Administrative Order (AO) are awaiting publication in the Official Gazette, the official publication of the government of the Philippines.

The CPRs and AO for publication are as follows: CPR Part 11, "Licenses for Industrial Radiography and Radiation Safety Requirements for Radiographic Operations"; CPR Part 14, "Licenses for Medical Use of Sealed Radioactive Sources in Brachytherapy"; and CPR Part

Distribution of Radioactive Material Licenses Issued by PNRI



- Commercial establishments
- Clinics and hospitals
- Industry
- Industrial radiography
- Research institutions

17, "Licenses for Commercial Sale and Distribution of Radioactive Materials"; and AO No. 002, Series of 2009, "Authorization for Transfers of Nuclear-Related Dual-Use Equipment, Materials, Software and Related Technology". In support of CPR Part 11, a Regulatory Guide for CPR Part 11 has been prepared and submitted for approval. PNRI Information Notice 2010-01 on "Certification of Radiographers by an Independent Certifying Body" has been issued and disseminated to all stakeholders.

The SDS is also taking the lead in the review and revision of the Comprehensive Nuclear and Radiation Safety Regulation Act of 2010 in collaboration with the Technical Working Group in the Philippine Congress, the Office of the Legal Affairs of the International Atomic Energy Agency (IAEA) and the Nuclear Regulatory Division Technical Working Group.

LICENSING, REVIEW AND EVALUATION

The Licensing Review and Evaluation Section (LRES) evaluated applications to use, sell and distribute radioactive materials in the country. This procedure ensures that the applicants comply with nuclear regulatory requirements, among others.

As a result of LRES's evaluation and recommendation, the PNRI issued a total of 310 radioactive material licenses (29 new, 237 renewed and 44 amended) to the following establishments in 15 regions in the country : (1) 35 commercial establishments who engage in selling and distribution of radioactive materials; (2) 90 clinics and hospitals who use radioactive materials in the diagnosis and treatment of diseases; (3) 138 companies/institutions for industrial purposes, such as level gauging, thickness gauging, among others; (4) 25 for industrial radiography; and (5) 22 institutions for research purposes.

The LRES conducted pre-licensing verification inspections for issuance of the abovementioned licenses to confirm the applicant's and licensee's commitments in their license applications.

Pre-licensing inspection in a nuclear medicine facility

Inspection of a teletherapy facility in a hospital in Region 3

In addition, the PNRI issued 562 Certificates of Release to the Bureau of Customs for the release of shipments of imported radioactive materials to PNRI-licensed users and/or suppliers.

INSPECTION AND ENFORCEMENT

The Inspection and Enforcement Section (IES) carried out inspections and audit of licensed radioactive materials and facilities to monitor compliance of licensees to PNRI regulations and specific conditions relative to radiation safety and security requirements.

For 2010, IES conducted announced inspections and audit of 192 radioactive materials and facilities and unannounced inspections of six industrial facilities. Follow-up inspections of five facilities were also carried out to ensure that corrective measures on the previous deficiencies and deviations from the regulations were implemented appropriately and effectively. For a facility which was found to have significant non-compliance to PNRI regulatory requirements, the Institute issued a Notice of Violation. IES completed the evaluation reports and assessment of licensees' 108 responses on the corrective action/s to address non-compliance findings during inspection. Of the facilities inspected, around 67 percent of the licensees were found to comply with regulations and license conditions.

IES issued a total of 4,490 "Authority to Transport" certificates requested by licensed stakeholders for the transport of radioactive materials to authorized destinations.

In support of the PNRI Internal Regulatory Control Program, compliance monitoring and audit of seven PNRI facilities were completed. The results showed that the inspected facilities observe and comply with the applicable PNRI policies and Office Orders as well as the general and special conditions stated in the issued authorizations.

RADIOLOGICAL IMPACT ASSESSMENT

The Radiological Impact Assessment Section (RIAS) evaluated the radiological impact of the transport of Fluorodeoxyglucose (FDG-18) , a radioactive pharmaceutical used for medical imaging. The possible radiation dose of the transporter or driver during the normal or routine transport by motorcycle of FDG-18 from a hospital in Quezon City to its branch in Taguig City was assessed as well as the dose for the members of the public

Results of the assessment showed that the external radiation hazard during the transport of this radioactive material did not exceed the limits specified in the Code of PNRI Regulations (CPR) Part 3, Standards for Protection Against Radiation and CPR Part 4, Regulations for the Safe Transport of Radioactive Materials.

Thus, the transport of FDG-18 did not pose any external radiation hazard to the driver and the public. The results of the radiological impact assessment also indicated that in the event of a road mishap, it is very unlikely that the radioactive material will contaminate the environment considering the different levels of safety configurations used for the transport box of FDG-18.

RADIOLOGICAL EMERGENCY PLANNING AND PREPAREDNESS

An IAEA Emergency Preparedness and Response Mission was conducted as part of enhancing the implementation of the Radiological Emergency Preparedness Plan in the country

Emergency Preparedness and Response Review (EPREV) Mission. As part of enhancing the implementation of the Radiological Emergency Preparedness Plan (RADPLAN) in the country, the International Atomic Energy Agecy (IAEA) conducted the EPREV Mission to the Philippines. Nineteen representatives from seven government agencies involved in the RADPLAN attended the review mission meetings. The EPREV mission reviewed all aspects of the country's emergency arrangements at the local and national levels based on international requirements and on IAEA's guidance documents.

Chemical, Biological, Radiological and Nuclear Explosive (CBRNE) Protocol
The Radiological Impact Assessment Section (RIAS), with the continued coordination with the Technical Working Group on CBRNE of the National Anti-Terrorism Council, prepared the CBRNE protocol for response to radiological and nuclear terrorism.

Training of PNRI RADPLAN members on the use of radiation monitoring equipment

Manual for Radiological Emergency Monitoring and Control
To further increase the capability of the PNRI Emergency Response Organization, a Procedure Manual for Radiological Emergency Monitoring and Control (REMCON) was developed. The manual will be presented to the members of the PNRI REMCON Team and will be implemented during response operations in the event of an emergency.

IAEA Emergency Exercise. As mandated by the Convention on Early Notification of a Nuclear Accident (ENAC) of the IAEA, the PNRI participated in the following emergency exercises conducted by the IAEA Incident and Emergency Response Center (IEC): (1) ConvEx-2a exercise on 3 March 2010, which was designed to test the response time of the National Competent Authority (NCA) and the immediate access to ENAC website; and (2) ConvEx-1a exercise on 13 September 2010, which was designed to test the availability of the National Warning Point (NWP), the accuracy of fax contact, and the accessibility of the ENAC website.

Training Course. To develop the capability of the RADPLAN members, RIAS conducted a training on the use of radiation detection instruments. Two trainings and drills on Emergency Planning and Preparedness participated in by 37 professionals from various radiological industries were also conducted as part of the PNRI training courses.

NUCLEAR SAFEGUARDS AND SECURITY

Safeguards

The PNRI continued to fulfill its obligations on the Philippines' commitment to the International Atomic Energy Agency (IAEA) on the Non-Proliferation of Nuclear Weapons Treaty (NPT) in ensuring that nuclear materials are not diverted to non-peaceful applications.

Additional Protocol. The Additonal Protocol was entered into force on 26 February 2010.

In preparation for the implementation of the AP, the PNRI conducted a five-day national training seminar in cooperation with the IAEA, the United States Department

National Training Seminar on Additional Protocol Implementation held in Crowne Plaza Hotel, Manila Galleria

Physical inventory verification inspection of nuclear fuels at the Philippine Research Reactor at PNRI in December 2010

IAEA safeguards inspectors together with a BNPP representative during conduct of complementary access at BNPP, Morong, Bataan on 3 December 2010

of Energy (US-DOE), and the Australian Safeguards and Nonproliferation Office (ASNO). The participants to this seminar included PNRI staff and representatives from the Department of Foreign Affairs, Department of Energy, National Power Corporation and Department of Trade and Industry.

In addition, the Philippines through PNRI, prepared the initial declarations under Article 2 of the AP with the assistance of Mr. Russell Leslie, an expert from ASNO. A full set of the initial declarations, consisting of eight reports, were submitted to the IAEA. The PNRI also submitted three quarterly reports on exports identified in the Annex II of the AP.

Safeguards inspections. Pursuant to the safeguards agreement, the PNRI hosted an annual inspection of the IAEA safeguards inspectors for the conduct of physical inventory verification of nuclear fuels and design information verification inspections at the Philippine Research Reactor (PRR) at PNRI. In conjunction with the inspection, the first complementary access was conducted at the PNRI site and the Bataan Nuclear Power Plant (BNPP) site to verify the information submitted by PNRI in December 2010. Nuclear material accounting reports for PRR-1 and for BNPP were submitted to the IAEA through secure communication system.

GLOBAL THREAT REDUCTION INITIATIVE (GTRI)

To help address the issue of nuclear security and reduce the threat of nuclear terrorism, the PNRI participated in the GTRI program of the United States Department of Energy' (US DOE).

Basic Ordering Agreement with US DOE/ Pacific Northwest National Laboratory (PNNL). The Nuclear Safeguards Section of the PNRI reviewed the works being done by the security contractor G4S at teletherapy facilities of the Bureau of Health Devices and Technology (BHDT), Philippine Gamma Knife, Inc., and Baguio General Hospital and Medical Center. Physical protection upgrades on the facilities were evaluated for compliance with international standards.

The Section also evaluated the preventive and corrective maintenance activities of G4S on the completed security upgrades at the following medical centers: National Kidney and Transplant Institute, Veterans Memorial Medical Center, Dee Hwa Liong Foundation Medical Center, Rizal Medical Center, Jose R. Reyes Memorial Medical Center, UP-Philippine General Hospital, Western Visayas Medical Center and Zamboanga City Medical Center.

The security upgrades of the following PNRI facilities were also evaluated: Multi-purpose Irradiation Facility, Radioactive Waste Management Facility and Secondary Standards Dosimetry Laboratory. Reports were submitted to the US DOE/PNNL.

PNRI staff together with the Japanese delegation that presented Japan's Integrated Comprehensive Support Center for Nuclear Non-Proliferation and Nuclear Security on 11 October 2010

PNRI meeting with US DOE/PNNL, ANSTO and the PNP regarding response to security incidents

GTRI-Regional Security of Radioactive Sources (RSRS). The Nuclear Safeguards Section facilitated and participated in meetings on radiological security incident at facilities using high-risk radioactive sources. These meetings were participated in by representatives from the Philippine National Police (PNP) and a team of experts from the US DOE and PNNL-Australian Nuclear Science and Technology Organisation.

The meetings resulted in the following: (1) close cooperation and coordination among the facility, PNP and PNRI in preparedness and planning during and after an incident; (2) assessment of training needs of the PNP responders and subsequent development of the training program/curriculum; (3) provision of equipment (radiation pagers and protective clothings) for the PNP to be used in response to incidents ; (3) drafting of a Memorandum of Agreement (MOA) with the PNP relative to response and training. The MOA was signed between the PNRI Director, PNP Director and the PNP Chief on 15 September 2010.

Security of Radioactive Materials During Transport. The Safeguards Section facilitated two meetings with experts from Oakridge National Laboratory. The meetings resulted in the following: (1) putting up of a transport security communication control center, including provision of associated equipment and vehicle dedicated for the transport of radioactive material; (2) conduct of Train-the-Trainers Course; (3) development of transport security regulation; (4) conduct of awareness seminar for managers and decision makers; and (5) workshop with tabletop exercises to be participated in by all agencies involved in the response to security incidents/malicious acts.

Megaports Initiative Project

The PNRI, under a Memorandum of Intent with the US Department of Energy (US-DOE) actively participated in the Megaports Initiative project in coordination with the Bureau of Customs (BoC), and the Philippine Ports of Authority (PPA). The project involved the detection of illicit shipment

Preventive maintenance of the radiation portal monitors at the South Harbor and Manila International Container Terminal

A set of instruments used in the field survey for geotechnical investigation and grounwater prospecting

of nuclear and other radioactive materials through the Radiation Portal Monitors (RPMs) installed at the Port of Manila.

Based on the Memorandum of Agreement with BoC and PPA, the PNRI spearheaded the implementation of Phase II upgrades of the Megaports system. The other activities implemented were: (1) management of the operation of the PNRI Mirror Central Alarm System (CAS) and provision of technical assistance to the BoC CAS and terminal operators in the event of an alarm; (2) coordination in the troubleshooting and monthly preventive maintenance of the RPMs and the information technology component of the RPM systems at the South Harbor and the Manila International Container Terminal; and (3) submission of official reports to US DOE/PNNL.

ESTABLISHMENT OF A NATIONAL RADIOACTIVE WASTE DISPOSAL FACILITY

The evaluation of the co-location of a near surface facility and borehole disposal for high activity disused radioactive sources was continued by PNRI within the framework of an IAEA Technical Cooperation Project.

In preparation for the drilling of a deep borehole, electrical resistivity survey was done for geotechnical investigation and groundwater prospecting. Groundwater level, thickness of aquifer, lithology structures like fractures, fault and contamination such as salinity intrusion were determined. In parallel, water samples were collected for geochemical analysis.

PNRI worked also extensively with the local government to ensure acceptance of the preferred site for the proposed radioactive waste disposal project. As a result of this effort, a resolution from the members of the Sangguniang Bayan was obtained to facilitate implementation of all scientific, technical and related activities at the site.

In support of this national project, the Institute also hosted a one week expert mission to review and finalize the proposed Philippines' National Policy and Strategy on Radioactive Waste Management and Spent Fuel. The draft document is now undergoing review for consideration of the national government.

S & T Linking and Networking

As the government's sole agency on matters concerning nuclear science and technology, the PNRI expanded its collaboration with both local and international agencies working under the same mandate. The linkage and networking efforts aim to bring to a higher level the research and development projects applying nuclear technology; reinforce the regulatory capability of PNRI; enhance the regulatory mandate of the PNRI; and promote the beneficial uses of nuclear science and technology in the Philippines.

Local S & T Networking – PNRI successfully worked on several projects with support from the Department of Science and Technology (DOST) and other DOST agencies, namely: Philippine Council for Industry and Energy Research and Development • Philippine Council for Agriculture, Forestry and Natural Resources Research and Development • Technology Application and Promotion Institute

The PNRI has also continued its collaborative projects with the following agencies/institutions • Department of Energy • National Power Corporation • Bureau of Soils and Water Management • Bureau of Plant Industry • Environmental Management Bureau- Department of Environment and Natural Resources • Department of Agriculture (DA) -Bureau of Plant Industry (BPI).

IAEA representatives meet with DOST Secretary Mario G. Montejo to discuss the implementation of the IAEA water Availability Enhancement Poject (I-WAVE). IAEA identified the Philippines as one of the pilot areas for I-WAVE.

VISIT OF IAEA DIRECTOR GENERAL YUKIYA AMANO TO THE PHILIPPINES

IAEA Director General Yukiya Amano was guest speaker at the closing ceremonies of the 38th Atomic Energy Week celebration at PNRI .

DG Amano's three-day visit in December included the DOST, Department of Foreign Affairs, Department of Health, the Department of Energy, the Bataan Nuclear Power Plant in Bagac, Bataan, and the La Mesa Dam, the main water reservoir in Metro Manila.

Foreign S & T Networking – The Institute's international linkages with institutions and nuclear science and technology organizations abroad were likewise strengthened (see Appendices, Table 6 on page 41). Through these linkages, the PNRI was able to benefit from the following: eight IAEA research contracts; seven IAEA technical cooperation projects; the services of 26 foreign experts/ mission delegates; and 85 fellowships and travel grants for PNRI and non-PNRI personnel. (see Appendices, pages 42-50).

PNRI's international partners in the development of nuclear science and technology were the following:

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

Partnerships that make possible the transfer of technology information and expertise were maintained with the following agencies/institutions:

- United States Department of Energy
- United States Department of Agriculture
- Ministry of Science, Technology, Education, Culture and Sports of Japan
- Nuclear Safety Research Association of Japan

"Accelerating Socio-Economic Development Through Nuclear Science and Technology"

The National Power Corporation Chorale renders a special number.

THANKSGIVING MASS
Officiated by:
Rev. Fr. Jerry Manlangit, O.P,
Sto. Domingo Parish

WREATH LAYING
at the monument of Brig. Gen. Florencio A. Medina, considered as the Father of Atomic Energy in the Philippines

OPENING CEREMONIES
Angelo Palmones, Vice Chairman, Committee on Science and Technology of the House of Representatives is represented by Dr. Florentino Tesoro as keynote speaker at the opening ceremonies on December 6. Dr. Tesoro is the Chief of Staff of the Office of Congressman Palmones.

TECHNICAL SESSIONS
A two-day technical session was held on the agricultural, health, medical, environmental and industrial applications of nuclear sicence and technology

PRESS CONFERENCE
Dr. Alumanda M. Dela Rosa briefs the media representatives on updates on PNRI projects/ activities during the AEW` Press Conference held at PNRI on December 6.

CLOSING CEREMONIES
Dr. Yukiya Amano, Director General of the International Atomic Energy Agency, was the guest speaker during the closing ceremonies on December 11.

EMPLOYEES' DAY

38th Atomic Energy Week Celebration

6 - 10 December 2010, PNRI

OPENING OF EXHIBITS
Dr. Florentino Tesoro, assisted by PNRI Director Alumanda M. Dela Rosa, cuts the ceremonial ribbon to formally open the 2010 AEW Exhibits.

PNRI Choir renders a special number

2010 AEW SPECIAL AWARDS

PNRI TAGLINE CONTEST:

Winner

MR. JOVEN B. BRAVO
DOST-GIA Contractual Laboratory Aide II

*Entry-**"Nuclear Science and Technology: Working for You"***

38th AEW BEST TOUR GUIDE
MS. GLORIAMARIS L. CARAOS
Science Research Specialist II
Biomedical Research Section
Atomic Research Division (ARD)

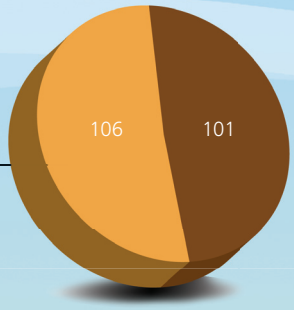
38th AEW BEST MALE USHER
MR. RHETT SIMON DC. TABADDA
Science Research Specialist I
Chemistry Research Section, ARD

38th AEW BEST FEMALE USHERETTE
MS. ANA MARIA S. VELUZ
Senior Science Research Speciaist
Agricultural Research Unit, ARD

Stacy Glaze A. Aguirre (2nd from left) from Ismael Mathay Sr. High School and Geoferson Cimaggala (extreme right) of General Aguinaldo High School were the first prize winners for the AEW essay writing and on-the-spot poster making contests, respectively . A total of 71 high-school students participated in the contests sponsored by the Office of the Mayor of Quezon City

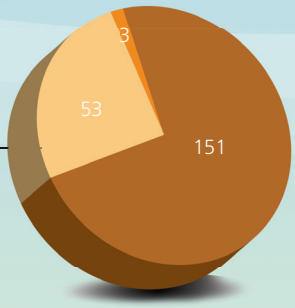
BY SEX

Male	101
Female	106
Total	207



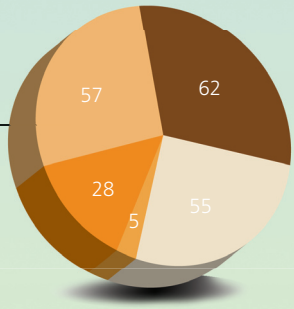
BY STAFF CATEGORY

Technical	151
Administrative	53
Managerial	3
Total	207



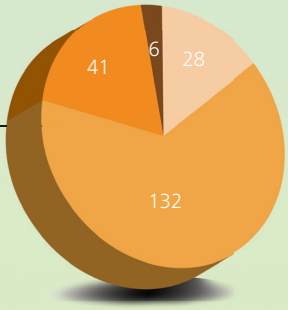
BY STAFF ACTIVITY

R&D	62
S&T Services	55
S&T Education	5
Regulatory	28
Administrative	57
Total	207



BY EDUCATION

Ph.D	6
MS/MA	28
BS/BA	132
Below BS	41
Total	207



PROFILE OF R&D PERSONNEL BY POSITION		
CATEGORY	NUMBERS	% DISTRIBUTION
Total Number of R&D Personnel	63	30.43%
BY POSITION		
Scientists and Engineers	48	76.19%
Technicians	9	14.29%
Auxiliary Personnel	6	9.52%
	63	100.00%

PROFILE OF SCIENTISTS AND ENGINEERS		
BY SEX		
Male	17	35.42%
Female	31	64.58%
	48	100.00%
BY AGE GROUP		
20 years old and below	–	0.00%
21-30	10	20.83%
31-40	10	20.83%
41-50	12	25.00%
51-60	13	27.08%
61 years old and above	3	6.26%
	48	100.00%
BY EDUCATIONAL ATTAINMENT		
PhD	1	2.08%
MS/MA	16	33.34%
Post BS/BA Diploma	–	0.00%
BS/BA	30	62.50%
Post High School Diploma	1	2.08%
High School and below	-	0.00%
	48	100.00%
BY FIELD OF RESEARCH WORK		
Natural Sciences	30	62.50%
Engineering and Technology	6	12.50%
Agricultural Sciences	9	18.75%
Medical Sciences	3	6.25%
Social Sciences	–	0.00%
Humanities	–	0.00%
	48	100.00%

Human Resource Development

The PNRI has always emphasized the need for the development of human resources in the field of nuclear science and technology as a major component for the implementation of the institute's mandate to develop and regulate the safe and peaceful uses of nuclear science and technology in the Philippines.

LOCAL

- 873 PNRI and non-PNRI staff from government and private agencies successfully completed the 50 nuclear training courses conducted by PNRI. See pages 37 to 38.
- 83 students were accepted by PNRI for on-the job training and 18 students for thesis advisorship at the different facilities/ laboratories at PNRI. See page 39.
- 32 locally –sponsored training/seminar/workshop in various fields were participated in by PNRI employees. See pages 51 to 52.
- A PNRI senior science research specialist who availed of the DOST scholarship program obtained her Ph.D. in Nuclear Engineering and Management while two PNRI staff pursued their doctorate degrees in Environmental Science in 2010. On the other hand, six staff continued their graduate studies on their own (3 PhDs and 3 MS degrees). See page 53..

FOREIGN

- 179 training/fellowship grants were availed of by PNRI and Non-PNRI personnel through linkage with foreign institutions and agencies. See pages 42 to 51.

PNRI RECOGNITION AWARDS

PNRI gave recognition awards to the following during the Employees' Day of the 38th Atomic Energy Week Celebration on December 9.

Director's Choice

MS. GLENDA B. OBRA
Supervising Science Research Specialist
Agricultural Research Section
Atomic Research Division (ARD)

Division Awardee: ARD

MR. FERNANDO B. AURIGUE
Science Research Specialist II
Agricultural Research Section
Atomic Research Division (ARD)

Division Awardee: NRLSD

DR. VANGELINE K. PARAMI
Supervising Science Research Specialist
Licensing, Review and Evaluation Section
Nuclear Regulations, Licensing and Safeguards Division (NRLSD)

Division Awardee: NSTD

MS. LUVIMINA G. LANUZA
Supervising Science Research Specialist
Irradiation Services
Nuclear Services and Training Division (NSTD)

Division Awardee: FAD

DR. EMMA L. CANCINO
Medical Officer IV, Medical Clinic
Finance and Administrative Division (FAD)

Division Awardee: FAD

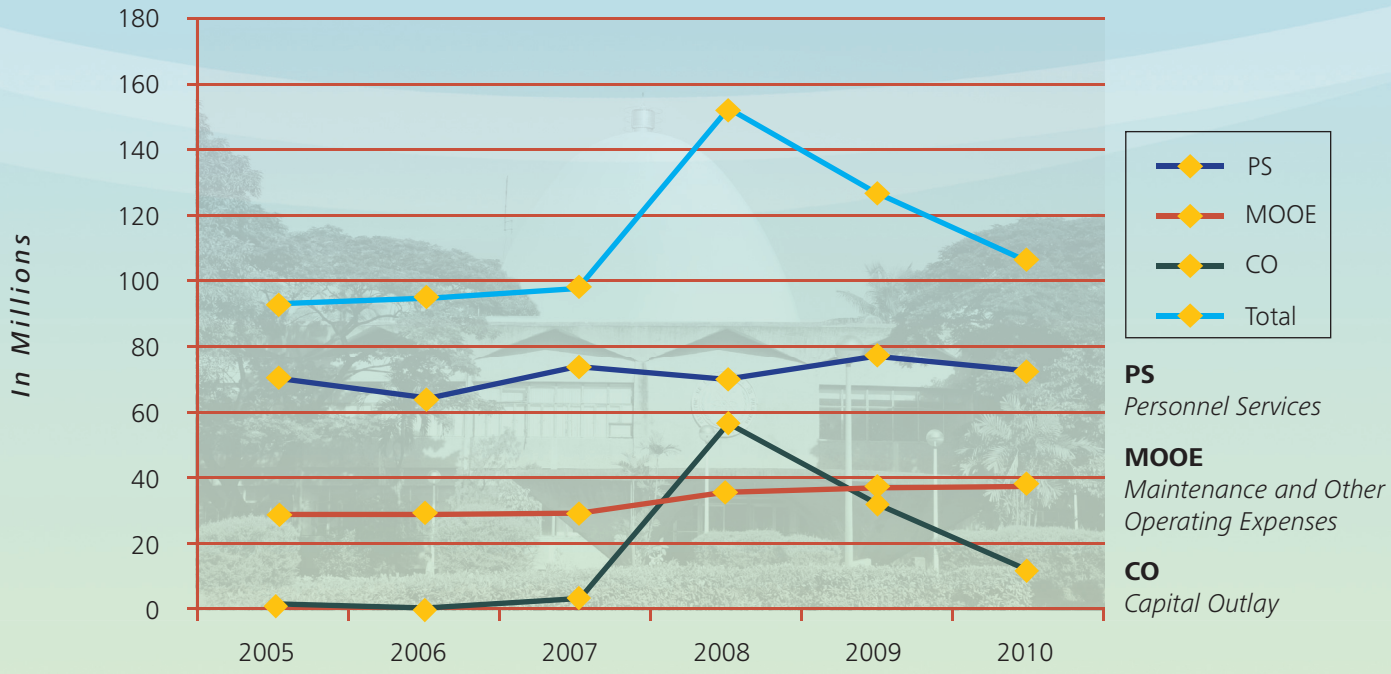
MS. ALICIA F. LAGUNZAD
Administrative Officer IV
Personnel Unit
FAD

RECOGNITION AWARD RECEIVED BY PNRI

Second Place * Best Paper Award (Technical Upstream Category), for the entry "Modification of the Commercial Protocol on Extended Hot Water Dip as a QuarantineTreatment of Mango Fruits" by Elda B. Esguerra, Glenda B. Obra, Daphne Cassandra R. Hilario, and Emmanuel Q. Amatorio." Given during the 18th National Fruit Symposium, October 28, 2010, Tagbilaran City, Bohol.

Financial Resources

Trend of PNRI BUDGET • 2005 - 2010



PS
Personnel Services

MOOE
Maintenance and Other Operating Expenses

CO
Capital Outlay

Income vs. Year • 2005 - 2010

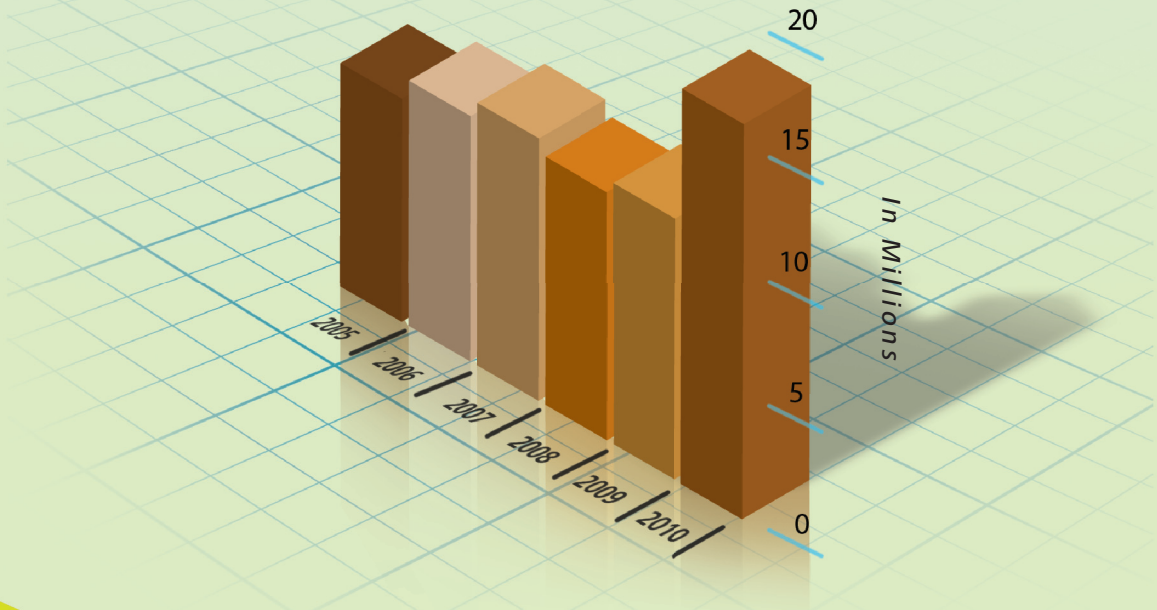


TABLE 1. TECHNICAL TRAINING COURSES/SEMINARS CONDUCTED IN 2010

TITLE OF TRAINING	TRAINING VENUE/ LOCATION	NO. OF PARTICIPANTS	INCLUSIVE DATES CONDUCTED	FUNDING SCHEME
NUCLEAR SCIENCE AND TECHNOLOGY				
Seminar in Nuclear Science for High School Science Teachers – 34th Session	PNRI, Diliman, Quezon City	23	April 19 – May 21	PNRI-sponsored
Nuclear Technology for University/College Faculty – 43rd Session	PNRI	7	April 19 – May 21	PNRI-sponsored
RADIOISOTOPE TECHNIQUES				
Radioisotope Techniques Training Course - 95th Session	PNRI	46	July 5 – 30	Individual fee-paying
RADIATION SAFETY				
Safety in the Use of Nuclear Equipment and Devices Training Course – 36th Session	PNRI	12	February 15 – 19	Individual fee-paying
Safety in the Use of Nuclear Equipment and Devices Training Course – 37th Session	Flexible Packaging Division, Inc., Batangas City	10	June 21 – 25	Company- sponsored
Radiological Health and Safety Course for Industrial Radiographers	PNRI	13	June 21 – July 2	Individual fee-paying
Radiation Safety Course for Medical and Radiopharmaceutical Facilities	PNRI	22	July 23 – October 1 (Fridays only)	Individual fee-paying
Safety in the Use of Nuclear Equipment and Devices Training Course – 38th Session	PNRI	34	August 9 – 13	Individual fee-paying
Safety in the Use of Nuclear Equipment and Devices Training Course – 39th Session	NPC Alliance Corp., Mariveles, Bataan	10	September 27 – October 1	Company-sponsored
Safety in the Use of Nuclear Equipment and Devices Training Course – 40th Session	United Pulp and Paper Co., Inc., Calumpit, Bulacan	10	October 11,12,19,20 and 21	Company-sponsored
Safety in the Use of Nuclear Equipment and Devices Training Course – 41st Session	DM Consunji, Inc., Makati City	10	October 18 – 22	Company-sponsored
Safety in the Use of Nuclear Equipment and Devices Training Course – 42nd Session	Holcim Phils., Inc., Davao City	10	November 8 – 12	Company-sponsored
Safety in the Use of Nuclear Equipment and Devices Training Course – 43rd Session	PNRI	15	November 22 – 26	Individual fee-paying
Safety in the Use of Nuclear Equipment and Devices Training Course – 44th Session	Rapu Rapu Minerals, Inc., Rapu Rapu, Albay	12	December 14- 18	Company-sponsored
NUCLEAR POWER				
Introduction to Nuclear Engineering – 3rd Session	PNRI	13	February 1 – 12	Company-sponsored
Introduction to Nuclear Power – 6th Session	PNRI	29	February 23 – 25	PNRI-sponsored
Nuclear Power Seminar for PNRI Non-Technical Personnel	PNRI	12	March 17	PNRI-sponsored
Introduction to Nuclear Engineering – 4th Session	PNRI	25	May 24 – June 4	Company-sponsored
PWR and the Overall Description of BNPP-1 (Module 3) – 1st Session	National Power Corporation (NPC), Bagac, Bataan	27	September 6 – 10	PNRI-sponsored
Understanding Nuclear Power (Awareness Seminar for PNRI Personnel)	PNRI	82	September 1	PNRI-sponsored
PWR and the Overall Description of BNPP-1 (Module 3) – 2nd Session	NPC, Bagac, Bataan	20	October 4 – 8	Company-sponsored
PWR and the Overall Description of BNPP-1 (Module 3) – 3rd Session	NPC, Bagac, Bataan	38	November 8 –12	Company-sponsored
NONDESTRUCTIVE TESTING (NDT) in cooperation with the Philippine Society for Nondestructive Testing, Inc. (PSNT)				
Ultrasonic Testing – Level 1	PNRI	2	January 11– 15	Individual fee-paying
Ultrasonic Testing – Level 2	PNRI	15	January 11 – 22	Individual fee-paying
Radiographic Testing – Level 2	PNRI	15	January 25 – Feb. 5	Individual fee-paying
Surface Methods – Level 2	PNRI	19	February 15 - 26	Individual fee-paying
Eddy Current Testing – Level 2	PNRI	11	March 1 – 12	Individual fee-paying

Ultrasonic Testing – Level 2	PNRI	20	March 15 – 26	Individual fee-paying
Radiographic Testing – Level 2	PNRI	32	April 19 – 30	Individual fee-paying
Radiographic Testing – Level 3	PNRI	2	April 19 – 30	Individual fee-paying
Surface Methods – Level 2	PNRI	16	May 17 - 28	Individual fee-paying
Ultrasonic Testing – Level 2	PNRI	13	May 31 – June 11	Individual fee-paying
Ultrasonic Testing – Level 2	PNRI	1	May 31 – June 11	Individual fee-paying
Ultrasonic Testing – Level 2	PNRI	7	June 7 – 21	Individual fee-paying
Radiographic Testing – Level 2	PNRI	21	July 5 – 16	Individual fee-paying
Surface Methods – Level 2	PNRI	17	July 19 – 30	Individual fee-paying
Surface Methods – Level 3	PNRI	2	July 19 – 30	Individual fee-paying
Ultrasonic Testing – Level 2	PNRI	25	August 9 – 23	Individual fee-paying
Radiographic Interpretation	PNRI	11	August 25 – 27	Individual fee-paying
Ultrasonic Testing – Level 2	PNRI	15	October 4 - 15	Individual fee-paying
Eddy Current Testing – Level 2	PNRI	10	Oct. 18 – Nov.2	Individual fee-paying
Radiographic Testing – Level 2	PNRI	18	Oct. 18 – Nov.2	Individual fee-paying
Surface Methods – Level 2	PNRI	18	November 8 - 19	Individual fee-paying
Surface Methods – Level 3	PNRI	1	November 8 - 19	Individual fee-paying
Ultrasonic Testing – Level 2	PNRI	10	December 14 - 18	Individual fee-paying
WELDING TECHNOLOGY – in cooperation with the PSNT				
Welding Inspectors' Course	PNRI	7	January 4 – 8	Individual fee-paying
Welding Inspectors' Course	PNRI	22	April 12 – 16	Individual fee-paying
Welding Inspectors' Course	PNRI	28	August 2 – 6	Individual fee-paying
Welding Inspectors' Course	PNRI	16	November 22 - 26	Individual fee-paying
TRAIN-THE-TRAINERS – in cooperation with the PSNT				
Train the Trainers on the Methodology, Organization & Materials for Training Courses	PNRI	19	Sept. 1 & 24, Oct. 22 & November 19	PNRI/PSNT-sponsored
TOTAL NO. OF COURSES/SEMINARS : 50			**TOTAL NO. OF PARTICIPANTS : 873**	

TABLE 2. NUCLEAR S & T TRAINING FOR UNDERGRADUATES

FIELD OF TRAINING	PNRI SECTION/UNIT	SCHOOL	COURSE	NO. OF STUDENTS
ON-THE-JOB-TRAINING				
Tissue culture and mutation induction; orchid embryo culture; radiosensitivity study of ornamental plants	Agricultural Research Section	Our Lady of Fatima – Valenzuela; New Era University; Rizal Technological University; Philippine Normal University; Technological University of the Philippines; Philippine Science High School – Cagayan Valley	BS Biology; BS Biology for Teachers; BS Environmental Science; High School	16
Determination of molecular weight of chitosan, production of PVP/carrageenan wound dressing; preparation and characterization of injectible gels; antioxidant studies on irradiated carrageenan; synthesis and characterization of carboxymethyl – carrageenan hydrogels; sedimentation rate studies using Pb-210 chronologies	Chemistry Research Section	University of the Philippines – Diliman (UP Diliman); University of Sto. Tomas; Polytechnic University of the Philippines	BS Chemistry; BS Biochemistry	9
Microbiological techniques	Biomedical Research Section	New Era University	BS Biology	1
Nuclear techniques in environmental studies	Health Physics Research Section	Philippine Normal University and Polytechnic University of the Philippines	BS Biology for Teachers; BS Chemistry	4

Development and applications of x-ray spectroscopic techniques in the characterization of advanced materials	Applied Physics Research Section	De La Salle University ; University of Sto. Tomas	BS Physics; BS Applied Physics	4
Multi-elemental analysis of marine sediments of Manila Bay/Sorsogon Bay using x-ray fluorescence spectrometry; Tritium analysis; Analysis of B-radioactivity of carbon in acetic acid in vinegar	Analytical Measurements Research Section	University of the Philippines-Diliman; Philippine Science High School (PSHS) – Southern Mindanao; PSHS – Central Visayas	BS Chemistry; BS Biochemistry; and High School students	6
Dose measurements, operation of gamma irradiator	Irradiation Services	Technological University of the Philippines and Polytechnic University of the Philippines	BS Chemical Engineering BS Physics	3
Digitization of documents, trouble shooting of computer peripherals	Computer Services	Bulacan State University (BSU); PUP	BS Information Technology; BS Computer Engineering	4
Maintenance of nucleonic instruments	Electronics Services	Bulacan State University	Computer Technology	3
Nuclear information services	Information Services	New Era University; Asian Institute of Computer Studies	BS Computer Science	3
Nuclear training services	Nuclear Training Center	New Era Univrsity; BSU	BS Psychology; BS Biology; BS Computer Science	5
Program development for recording, monitoring and retrieving documents; data encoding & other administrative services	Human Resource Management; Finance and Administrative Division; Office of the Deputy Director; Technical Assistance Unit; Budget Unit; General Services; Property & Procurement Unit; Library Services	New Era University; Asian Institute of Computer Studies; Montessori Professional College; Polytechnic University of the Philippines	BS Psychology; BS Computer Science; BS Business Management; BS Computer Engineering; Management Technology; BS Business Administration	25
				TOTAL: 83

TABLE 3. THESIS/RESEARCH ADVISORSHIP

FIELD OF TRAINING	PNRI SECTION/UNIT	SCHOOL	COURSE	NO. OF STUDENTS
Measurement of thorium content of black sand from Palawan by gamma spectrometry	Radiation Protection Services	Polytechnic University of the Philippines (PUP)	BS Physics	2
Characteristics of different kinds of prepared Cs-137 swipe sample calibration source for radioactivity measurement and radiation control	Radiation Protection Services	PUP	BS Physics	3
Testing the efficiency calibration of gamma spectrometer using thorium nuclide	Radiation Protection Services	PUP	BS Physics	2
Effects of gamma irradiation on the impact strength of borocilicate glass	Physics Research Section	PUP	BS Physics	2
Antimutagenic effect of ethanolic extract of Penus Kasiya U Royle ex Gordon and radioactive potential of malunggay and cauliflower leaves' ethanolic extract	Cytogenetics Laboratory	Philippine Normal University	BS Chemistry for Teachers	4
Adsorption of heavy metal ions in a fused quartz glass discs	Physics Research Section	Eulogio Amang Rodriguez Institute of Science and Technology (EARIST)	BS Applied Physics	3
Collection of airborne particulate matter and formulating measure to lessen the level of lead in Valenzuela City	Analytical Measurements Research Section	PUP	BS Physics	1
Multi-elemental analysis of marine sediments	Analytical Measurements Research Section	University of the Philippines- Diliman	BS Chemistry	1
				TOTAL: 18

TABLE 4. IAEA RESEARCH CONTRACTS* IMPLEMENTED IN 2010

CLIENT		TITLE / DESCRIPTION OF RESEARCH	PROJECT DURATION		NAME OF RESPONSIBLE AGENCY STAFF
NAME OF BUSINESS/ ORGANIZATION	NAME / TEL. NO.		START	END	
IAEA	Teresa Benson Tel:(431) 2600-21568	Climate Proofing of Food Crops: Genetic Improvement for Adaptation to High Temperatures in Drought Prone Areas and Beyond	12- 15 2006	08-31-2011	Thelma F. Padolina Philippine Rice Research Institute
IAEA	Teresa Benson	The Early and Rapid Diagnosis of Transboundary Animal Diseases: Phase I - Avian Influenza	12-15 -2006	12-14- 2011	Cristina Legaspi Philippine Animal Health Center
IAEA	Teresa Benson	Integrated Analytical Approaches to Assess Indicators of the Effectiveness of Pesticide Management Practices at a Catchment Scale	06-11 – 2010	06-11 – 2015	Leonila Varca National Crop Protection Center
IAEA	Teresa Benson	Development of Irradiated Foods for Immuno-compromised Patients and Other Potential Target Groups	09-15-2007	12-31 2011	Zenaida M. de Guzman PNRI
IAEA	Teresa Benson	Assessment of Left Ventricular Function in Coronary Artery Disease with Nuclear Techniques	11-15 2010	11-15 2016	Charity Gorospe St. Luke's Medical Center
IAEA	Teresa Benson	Resource Sparing Curative Radiotherapy for Locally Advanced Squamous Cell Cancer of the Head and Neck	12-01- 2007	12-31-2011	Miriam Joy Calaguas St. Luke's Medical Center
IAEA	Teresa Benson	Development of Radiation-Processed Products of Natural Polymers for Application in Agriculture, Healthcare, Industry and Environment	01-01- 2008:	12-31-2011	Lucille V. Abad PNRI
IAEA	Teresa Benson	Individual Contract - 2.3.1.2 (G.1.04): Support to Member States for the Management of National and Transboundary Groundwater Resources			Soledad S. Castaneda PNRI

*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. TECHNICAL COOPERATION PROJECTS*

NAME OF IMPLEMENTING AGENCY	PROJECT COUNTERPART/CLIENT NAME/TEL. NO. E-MAIL OF CONTACT PERSON	TITLE/DESCRIPTION OF RESEARCH	PROJECT DURATION		PROJECT COST IN PESOS
			START	END	
IAEA	Luvimina G. Lanuza lglanuza@pnri.dost.gov.ph	Upgrading the Gamma Irradiation Facility	2005	2011	730,887.00
IAEA	Neil Raymund D. Guillermo nrsguillermo@pnri.dost.gov.ph	Establishment of a National Nuclear and Radioanalytical Measurements Center	2007	2011	3,121,591.50
IAEA	Luvimina G. Lanuza lglanuza@pnri.dost.gov.ph	Establishing an Electron Beam Facility	2009	2011	1,632,894.00
IAEA	Estrella S. Caseria escaseria@pnri.dost.gov.ph	Upgrading the Philippine Nuclear Research Institute Secondary Standards Dosimetry Laboratory (SSDL)	2009	2011	740,605.50
IAEA	Adelina DM. Bulos admbulos@pnri.dost.gov.ph	Setting Up a Facility for the Production of Molybdenum-99/Technetium-99m Generators	2009	2011	1,261,080.00
IAEA	Leonardo S. Leopando lsleopando@pnri.dost.gov.ph	Support for the Completion and Implementation of the Decommissioning Plan for the Philippine Research Reactor	2009	2011	-
IAEA	Ma. Visitacion B. Palattao mvbpalattao@pnri.dost.gov.ph	Conducting a Study and Evaluation of the Co-Location of a Borehole Disposal Concept with a Proposed Near-Surface Radioactive Waste Repository	2009	2011	1,626,012.00
				TOTAL:	**Php 9,113,070.00**

Technical Coopration (TC) 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 is provided in the form of three components, namely, expert assistance, equipment donation and overseas training.

TABLE 6. INTERNATIONAL SCIENTIFIC LINKAGES AND NETWORKS IN 2010

SCIENTIFIC INSTITUTION		NATURE/DESCRIPTION OF SCIENTIFIC LINKAGES	DATES OF ENGAGEMENT	
NAME OF INSTITUTION/COUNTRY	NAME/E-MAIL/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, 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 (FNCA)/ Japan	Thru PNRI	Regional projects	2000	Present
Comprehensive Nuclear Test Ban Treaty Organization (CTBTO)	Thru PNRI	Establishment/maintenance of international monitoring stations and data center; provision of training	1999	Present
Australian Nuclear Science and Technology Organization (ANSTO)	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 (NSRA)	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. IAEA EXPERTS/OTHER MISSIONS IN 2010

Field/Purpose	Name Of Expert/Mission	Date Of Visit
Setting -up a Facility for the Production of Molybdenum-99/Technetium-99m Generators	M. Azizul Hague	22- 26 Feb '10
Review of Project on Isotope Applications in Improving Water Resource Management and Protection	Pradeep Aggarwal	7-11 March '10
Instrument for Nuclear Safety Cooperation (INSC) Mission	Pierre Chuilon Mark Hulsmans	8 - 9 March '10
32ND RCA National Representatives Meeting	Dazhu Yang	25 - 29 April '10
2009– 2011 Technical Cooperation Projects	Reyad Kamel	24 -28 May '10
JAEA (Japan Atomic Energy Agency) Mission	Nobuyoshi Arai Y. Yabuuchi R. Sawahata M. Sawada	7 June '10
ROMP (Radiation Oncology Medical Physics Programme)	Simon Downes	10 June '10
National Waste Management Policy	Philip Metcalf John Greeves Y. Kawakami	7-11 June '10
EPREV (Emergency Preparedness & Response Evaluation) Mission	Peter Zombori David Woods Hamnah Mohd Ali Rasina Radzyalouska	12-16 July '10

Research Reactor Decommissioning	Vladan Ljubenov Paul Dinner	26–29 July '10
Cyclotron Project	Sam Berlangieri	28 July '10
Water Availability Enhancement Project	Spyros Kleistas	1–3 Sept '10
Human Resource Development Activities	Dr. Kushita N. Kouhei	4–6 Oct '10
Gamma Spectrometry	Sanjay Kumar Jha	17–21 Oct '10
Stable Isotope Techniques	Karyne Rogers	15–19 Nov '10
Visit to the Philippines	IAEA Director Gen. Yukiya Amano	8–10 Dec '10

TABLE 8. PNRI HOSTINGS

FIELD	PHILIPPINE PARTICIPANTS	AGENCY/ INSTITUTE	ORGANIZERS	VENUE	DATE
Regional Training Course on Application of Natural Radioisotopes in Studies of Land-based Pollutants in Marine Environments	Ryan Joseph Aniago, Paolo Tristan F. Cruz, Norman DS. Mendoza, Ryan U. Olivares Kadil Nasser and Iara Sotto	PNRI	IAEA	Crowne Plaza Galleria	12 –23 April '10
32nd Meeting of National RCA Representatives	Alumanda M. Dela Rosa, and Corazon C. Bernido	PNRI	IAEA	New World Hotel	27 – 30 April '10
Regional Coordination Meeting on Strengthening Radiation Protection in Medicine	Bayani San Juan Agnette Peralta	Bureau of Health Devices and Technology	IAEA	G Hotel	7 –11 June '10
Regional Training Course on Technology Transfer of Radiation Processed Products to Industry: Case Study	Fernando B. Aurigue, Jorge R. Sahagun Constancio Asis Jr., Veriza Rita C. Cruz, Charles Darwin T. Racadio	PNRI	IAEA	Richmonde Hotel	
2010 Meeting on Technology Transfer from Research to Commercial Application Sharing Experience in Commercialization of Beneficial Nuclear Technology	PNRI staff	PNRI	FNCA	New World Hotel	12 Nov '10
Workshop on Mutation Breeding & Biotechnology Project	Adelaida C. Barrida, Faye G. Rivera, Ana Maria S. Veluz, Roland V. Rallos Olive Damasco, Juliet Arañaz	PNRI	FNCA	Linden Suites	8 – 11 Nov '10

TABLE 9. NON PNRI HUMAN RESOURCES DEVELOPMENT (FOREIGN) IN 2010

FIELD	NAME	AGENCY	TRAINING VENUE	DATE	SPONSOR
TRAINING COURSE					
Advanced Conceptual and Numerical Methods for Modeling Subsurface Processes Regarding Nuclear Wastes Repository Systems	Carlo Arcilla	National Institute of Geological Sciences-University of the Philippines-Diliman	New Mexico, USA	19 – 25 June '10	IAEA
Application of Isotope Techniques to Study Marine Coastal Pollution Issues	Ma. Teresa Escobar	Marine Science Institute	Vietnam	18 – 29 Oct '10	IAEA
Occupational Radiation	Jake John Galingana	Jose Reyes Memorial Medical Center	Jordan	31 Oct – 4 Nov '10	IAEA

Leadership and Management for Introducing and Expanding Nuclear Power Programmes	Froilan Tampinco Mauro Marcelo	National Power Corporation	Argonne, Illinois, USA	1 – 12 Nov '10	IAEA
Imaging in Ischemic Heart Disease and Cardiac Failure for Advanced Users	Arlene Ong Ortiz	Philippine Heart Center	Tehran, Islamic Republic of Iran	27 Nov – 1 Dec '10	IAEA
Exercise Preparation, Conduct and Evaluation	Joseph Bacareza	Bureau of Fire Protection	Vietnam	17 – 21 May '10	IAEA
Development of a Near Surface Disposal Facility	Jason Villegas	Department of Energy	India	15 – 19 Feb '10	IAEA
Advanced Clinical Applications of PET (Positron Emission Tomography)	Asela Barroso Rhiamar Sauler-Gomez	Philippine Heart Center De La Salle University Medical Center	India	24 – 28 May '10	IAEA
SEMINAR/WORKSHOP					
International Workshop on Seismic Safety of Nuclear Installations	Guillermo Ansay	Department of Energy	Japan	17 – 19 March '10	IAEA
Workshop on Implementing Legislation in Nuclear Security for Certain Asian States	Raymund Joe Quilop	Department of National Defense	Austria	26 – 28 April '10	IAEA
IAEA Workshop on Project Management for New Nuclear Power Project	Danilo Sedilla	National Power Corporation	Republic of Korea	10 – 14 May '10	IAEA
IAEA Regional Asia and the Pacific Seminar on Facts of Nuclear Power and Considerations to Launch a Nuclear Power Programme	Pio Benavidez, Urbano Mendiola Dennis Gana Sharon Rivera	National Power Corporation Philippine Embassy in Vienna	China	14 – 17 July '10	IAEA
Commission for the Comprehensive Nuclear Test Ban Treaty Organization (CTBTO) Workshop on Capacity Building for Southeast Asia, the Pacific and the Far East (SEAPFE) States	Alex Cabrera	PHIVOLCS	Australia	17 - 21 May '10	CTBTO
South East Asia Regional Workshop on Radioactive Sources Security, Level B	Gerald Gallardo Dante Bernardo	Cifra Marketing Corporation Welders Testing Lab. (PHILS), INC.	Australia	6 – 10 Sept '10	ANSTO
MEETING					
IAEA Technical Meeting/Workshop on Topical Issues on Infrastructure Development: Managing the Development of National Infrastructure for Nuclear Power	Sherie Anne Jimenez Cristina Prima	National Power Corporation (NPC) Department of Energy (DOE)	Austria	9 – 12 Feb '10	IAEA
IAEA Plenary Meeting of the Network of Centers of Excellence for Underground Research Facilities (URF Network)	Carlo Arcilla	National Institute for Geological Sciences-University of the Philippines	Austria	3 – 4 March '10	IAEA
3rd Meeting of the Nuclear Safety Strategy Dialogue	Danilo Sedilla	National Power Corporation	Indonesia	22 – 23 April '10	IAEA
IAEA Regional Meeting on the Successful Launching of Nuclear Power Program	Victoria Francisco		Republic of Korea	27 Sept – 8 Oct '10	IAEA
Follow-Up Training Meeting/Workshop of E-Training on Message	Agerico Isorena Corazon Macaraeg	National Power Corporation	Austria	11 – 15 Oct '10	IAEA
Technical Meeting/Workshop on Sharing Experiences Among Countries Embarking on Nuclear Power in South East Asia	Salvador Sarmiento and Ma. Corazon Baluyut	National Power Corporation	Indonesia	13 – 15 Oct '10	IAEA
Regional Meeting to Create a Network of Medical Professionals on Radiation Protection of Children	Livy Magno		Thailand	15 – 17 Dec '10	IAEA
CONFERENCE/ CONGRESS/ SYMPOSIUM/ FORUM					
International Conference on Human Resource Development for Introducing and Expanding the Nuclear Power Programme	Aurora Dionisio	National Power Corporation	Abu Dhabl, UAE	14 – 18 March '10	IAEA

54th Regular Session of the International Atomic Energy Agency General Conference	Fortunato Dela Peña	DOST	Austria	20 – 24 Sept '10	IAEA
International Symposium on Standards Application and Quality Assurance in Medical Radiation Dosimetry	Julius Cezar Rojales	St. Luke's Medical Center	Austria	9 – 12 Nov '10	IAEA
SCIENTIFIC VISIT/ EXPERT MISSION/ CONSULTANCY					
Scientific Visit	Edmundo Vargas Edwin Romel Navaluna Roy Anthony Luna	UP, National Institute of Geosciences Environmental Management Bureau AMH Philippines, Inc	Belgium	28 June – 2 July '10	IAEA

TABLE 10. PNRI HUMAN RESOURCES DEVELOPMENT (FOREIGN) IN 2010

FIELD	NAME	TRAINING VENUE	DATE	SPONSOR
ON-THE -JOB TRAINING				
Repair and Maintenance of Non-Destructive Testing Equipment	Eduardo T. Cabildo	Malaysia	8 Aug – 30 Sept'10	IAEA
Regulatory Inspection of Nuclear Power Plant (NPP) Under Construction	Giuseppe Filam O. Dean and Edgar G. Racho	Republic of Korea	8 – 19 Nov '10	IAEA
TRAINING COURSE				
Winter Course of "Plant Safety Course"	Neil Raymund D. Guillermo	Japan	18 Jan – 12 Feb'10	MEXT
Development of a Near Surface Disposal Facility	Abelardo A. Inovero	India	15 – 19 Feb'10	IAEA
Radiation Processing Facilities and Applications	Franklin A. Pares	Malaysia	1 March – 31 May '10	IAEA
Comprehensive Course on Nuclear Law for Member States of the Asia and the Pacific Region	Rosita R. Daroy	Malaysia	8 – 19 March'10	IAEA
Association of Southeast Asian Nations (ASEAN)+3 Nuclear Human Resources Development Program (HRDP) First Civilian Nuclear Energy Working Level Course	Teofilo V. Leonin, Jr.	Republic of Korea	22 March – 9 April'10	Govt. of Korea
Radiopharmaceuticals	Ma. Teresa L. Borras	Indonesia	12 April – 11 Oct '10	IAEA
First Annual World Nuclear University School on Radioisotopes (WNU-RI School)	Kristine Marie D. Romallosa	Republic of Korea	15 May – 4 June'10	KAERI
Exercise Preparation, Conduct, and Evaluation	Ma.Teresa A. Salabit	Viet Nam	17 – 21 May '10	IAEA
Radiation Processing Facilities and Applications	Rizalina G. Osorio	Malaysia	1 June – 31 Aug'10	IAEA
Digital Industrial Radiography and Computed Tomography for Specific Industry Sectors	Renato T. Bañaga	Republic of Korea	7 – 18 June'10	IAEA
Training of Trainers of Radiation Detection Techniques for Front Line Officers	Teofilo V. Leonin , Jr., Julietta E. Seguis, Neil Raymund D. Guillermo and Nelson P. Badinas	Italy	14 – 23 June'10	IAEA
Radiation Metrology and Dosimetry	Kristine Marie D. Romallosa	Malaysia	1 July – 31 Oct '10	IAEA
Demonstration on Up-scaling of Radiation Modification of Polymers for Agriculture Applications	Charito T. Aranilla Fernando B. Aurigue	Vietnam	6 – 9 July '10	IAEA
Project Executive Management for Quarantine Authorities and Nuclear Institute	Zenaida M. De Guzman	Republic of Korea	13 – 16 July '10	IAEA
Industrial Process Gamma Tomography for Multi-phase Process Investigation of Petrochemical Plants	Denis D. Aquino	Malaysia	19 – 23 July '10	IAEA

Self-Assessment of National Regulatory Safety Information Management System	Teofilo V. Leonin, Jr. Vangeline K. Parami	Malaysia	19 – 23 July '10	IAEA
Regulatory Control of Nuclear Power Plant Projects	Alumanda M. Dela Rosa	Republic of Korea	26 – 30 July '10	
Instructor Training Program 2010 of the Japan Atomic Energy Agency (JAEA)	Neil Raymund D. Guillermo and Carl M. Nohay	Japan	26 July – 15 Oct '10	JAEA
Advanced Techniques for Isotope and Related Applications In Water Resources Management	Raymond J. Sugcang, Norman DS. Mendoza	India	9 – 13 Aug '10	IAEA
International Training Course on the Security in Transport of Radioactive Material for Training Team Leaders	Vangeline K. Parami	Austria	16 – 20 Aug '10	IAEA
Setting Up a Facility for the Production of Molybdenum-99/Technetium-99m Generators	Ma. Adelina DM. Bulos	Vietnam and Bangladesh	23 Aug – 4 Sept '10	IAEA
Physical Protection of Nuclear Materials and Facilities	Teresita G. De Jesus	China	13 – 24 Sept '10	IAEA
Combating Illicit Trafficking in Nuclear and Other Radioactive Material	Teofilo V. Leonin, Jr.	China	14 – 17 Sept '10	IAEA
Security of Radioactive Sources	Sylvia S. Busine	Indonesia	4 – 8 Oct '10	IAEA
Two-Month Fellowship Programme in the Field of Radiation Processing Facilities and Applications	Arnaldo R. Valenzuela	Republic of Korea	4 Oct – 3 Dec'10	IAEA
Application of Isotope Techniques to Study Marine Coastal Pollution Issues.	Efren J. Sta. Maria	Vietnam	18 – 29 Oct '10	IAEA
Transition to Integrated Management Systems (IMS) Approach Supporting the Development of a Strong Safety Culture	Ma. Celerina M. Ramiro Susan S. Pascual	China	8 – 12 Nov '10	IAEA
Safety Case for Predisposal Management and Centralized Storage for Radioactive Waste	Lynette B. Cayabo Alfonso A. Singayan	Thailand	8 – 12 Nov '10	IAEA
Effective and Sustainable Regulatory Control of Radiation Sources	Thelma P. Artificio	Syrian Arab Republic	21 – 25 Nov '10	IAEA
Physical Protection of Nuclear Materials and Facilities	Lopito A. Caluag	Japan	29 Nov – 10 Dec '10	JAEA
Public Communications for Information Officers Preparing for and Responding to Radiation Emergency	Grace M. Carlos	Austria	6 – 10 Dec '10	IAEA
Workplace Planning for New and Expanding Nuclear Power Programs	Victoria Fe O. Medina Percedita T. Cansino	Vietnam	13 – 17 Dec '10	IAEA
SEMINAR/WORKSHOP				
IAEA Regional Seminar on Strengthening Nuclear and Radiological Security in Asian Countries	Graceta DL. Cuevas	Japan	21-22 Jan'10	IAEA
FNCA Safety Management System 2010 Workshop	Vangeline K. Parami	Australia	9-11 Feb'10	ANSTO
FNCA Workshop for the Project on Electron Accelerator	Charito T. Aranilla	Indonesia	1 – 5 March'10	MEXT
IAEA/ISSC International Workshop on Seismic Safety of Nuclear Installations	Rolando Y. Reyes	Japan	17 – 19 March'10	IAEA
IAEA Regional Workshop on the Regulatory Authority Information System (RAIS Web Portal) for Users in Asia	Nelson P. Badinas	UAE	28 March – 1 April'10	IAEA
IAEA Workshop on Implementing Legislation in Nuclear Security for Certain Asian States	Julietta E. Seguis	Austria	26 – 28 April'10	IAEA
Workshop on Project Management for New Nuclear Power Projects	Alan M. Borras	Republic of Korea	10 – 14 May '10	IAEA
Emergency Preparedness and Response Topical Group (EPRTG) Workshop on National Intervention Levels for Taking Urgent Protective Actions and Protection of Workers and the Annual Meeting of the EPRTG	Teofilo V. Leonin, Jr. Carl M. Nohay	Indonesia	10 – 14 May '10	IAEA

Commission for the Comprehensive Nuclear Test-Ban Treaty Organization (CTBTO) Workshop on Capacity Building for Southeast Asia, the Pacific, and the Far East (SEAPFE) States	Ana Elena L. Conjares	Australia	17 – 21 May '10	CTBTO
Forum for Nuclear Cooperation in Asia (FNCA) 2010 Workshop on Radiation Safety and Radioactive Waste Management Project	Maria Visitacion B. Palattao	Japan	21 – 25 May '10	MEXT
IAEA Workshop on Regulatory Requirements for Site Selection and Evaluation for Nuclear Power Plants	Teresita G. De Jesus	Viet Nam	7 – 11 Jun '10	IAEA
Workshop on Lessons Learned from Peer Review Missions	Maria Visitacion B. Palattao Alfonso A. Singayen	Belgium	28 June – 2 July '10	IAEA
Workshop on Radiation Emergency Management for Decision Makers and Technical Supporters	Teofilo V. Leonin, Jr.	Japan	28 June – 2 July '10	IAEA
Workshop on Lessons Learned from Peer Review Missions- Integrated Regulatory Review Service ((IRRS) and Annual Meeting of the Government and Regulatory Infrastructure Topical Group (GRITG)	Graceta DL. Cuevas Teofilo V. Leonin, Jr. Alan M. Borras	Viet Nam	6 – 9 July '10	IAEA
Workshop on Application of the Code of Conduct on the Safety of Research Reactors	Alan M. Borras	China	12 – 16 July '10	IAEA
RCARO Workshop on Enhancing RCARO Interactions with States	Alumanda M. Dela Rosa	Republic of Korea	13 – 15 July '10	RCARO
Train the Trainers Workshop on Emergency Preparedness and Response for PNRI	Teofilo V. Leonin, Jr. Estrella S. Caseria Cecilia M. De Vera Ma. Teresa A. Salabit Lynette B. Cayabo	Australia	2 – 6 Aug '10	ANSTO
Workshop on Training Management and Annual Meeting of the Education and Training Topical Group (ETTG)	Corazon C. Bernido Roel A. Loteriña	Republic of Korea	9 – 13 Aug '10	IAEA
Workshop on Web-Based Safety Analysis Competency	Cristina A. Petrache Joseph R. Tugo	Malaysia	16 – 20 Aug '10	IAEA
South East Asia Regional Workshop on Radioactive Sources Security Level B	Julietta E. Seguis Edgar G. Racho	Australia	6 – 10 Sept '10	ANSTO
Forum for Nuclear Cooperation in Asia (FNCA) Workshop on Research Utilizationr	Preciosa Corazon B. Pabroa	China	13 – 16 Sept'10	MEXT
Workshop on Train the Trainers in Nuclear Safety	Roel A. Loteriña Haydee M. Solomon	Republic of Korea	14 – 16 Sept '10	IAEA
International Workshop on New Reactor Siting, Licensing and Construction Experience	Corazon C. Bernido	Czech Republic	15 – 17 Sept '10	OECD/NEA
Regional Workshop on Inspection, Review and Verification of Research Reactor Safety	Lynette B. Cayabo	Korea	27 Sept – 1 Nov '10	IAEA
Workshop on Safety Assessment for Decommissioning	Maria Visitacion B. Palattao	Denmark	4 – 8 Oct '10	IAEA
Regional Workshop on Release of Sites and Building Structures Regional Workshop on Safety Assessment for Decommissioning	John M. Marquez	Germany Denmark	4 – 8 Oct '10	IAEA
Workshop on Research Reactor Utilization and Radiation Application Technology	Luvimina G. Lanuza Lorna S. Relleve	Republic of Korea	4 – 15 Oct '10	RCARO and KAERI
Workshop on General Concept of Safety Analysis for Nuclear Power Plants and Annual Meeting of the Topical Group on Safety Analysis (SATG)	Joseph R. Tugo	Republic of Korea	4 – 8 Oct '10	IAEA
International Workshop on Sustainable Management of Disused Sealed Radioactive Sources	Maria Visitacion B. Palattao	Portugal	11 – 15 Oct'10	IAEA
Forum for Nuclear Cooperation in Asia (FNCA) Safety Management Systems 2010 Indonesian Peer Review and Workshop	Haydee M. Solomon	Indonesia	11 – 15 Oct '10	ANSTO

IAEA Workshop on Effective Methods and Procedures for Evaluation of Emergency Preparedness and Response and Exercise (EPRTG)	Teofilo V. Leonin, Jr. Ma. Teresa A. Salabit	Japan	18 – 22 Oct'10	IAEA
Workshop on the Arrangements Notification and Assistance: Technical Operations Manual (ENATOM) Arrangements for Communicating with the International Atomic Energy Agency (IAEA) ASIA	Teofilo V. Leonin, Jr.	Austria	27 – 29 Oct '10	IAEA
6th International Workshop on Nuclear Energy and Non-Proliferation in East and Southeast Asia	Sylvia S. Busine	Republic of Korea	27 – 29 Oct '10	KAERI
IAEA/ANSN Workshop on Governmental Regulatory Infrastructure	Rosita R. Daroy Luzviminda L. Venida	Republic of Korea	9 – 12 Nov '10	IAEA
On-Site Inspection Directed Exercise 2010 (DE10)	Rolando Y. Reyes	Kingdom of Jordan	1 – 12 Nov '10	CTBTO
Regional Cooperative Agreement (RCA) Executive Management Seminar in Improving Food Safety and Security Using Irradiation	Celia O. Asaad	Sri Lanka	22 – 26 Nov '10	IAEA
6th International Workshop on Individual Monitoring of Ionizing Radiation	Graceta DL. Cuevas Teofilo Y. Garcia	Japan	29 Nov – 1 Dec '10	Intl Org. Committee
Regional Cooperative Agreement (RCA) Executive Management Seminar in Improving Food Safety and Security Using Irradiation	Celia O. Asaad	Sri Lanka	22 – 26 Nov '10	IAEA
Interregional Workshop on the Regulatory Authority Information System (RAIS)	Nelson P. Badinas	Austria	13 – 17 Dec '10	IAEA
MEETING				
3rd Technical Meeting on Application of Radiotracer and Radioassay Techniques to Seafoods Safety Assessment	Adelina DM. Bulos	Austria	1-5 Feb'10	IAEA
Working Group B Session of the Preparatory Commission for the Comprehensive Nuclear Test-Ban Treaty Organization (CTBTO)	Teofilo Y. Garcia	Austria	15 Feb – 5 March '10	CTBTO
Working Group Meeting for Development of Regional Co-operative Agreement Strategic Priorities 2012-2017	Alumanda M. Dela Rosa Lucille V. Abad	Austria	22 – 26 Feb'10	RCA
Meeting of the Working Group for Regional Cooperative Framework	Alumanda M. Dela Rosa	Austria	22 – 26 Feb'10	IAEA
Technical Meeting on Integration of Tools and Concepts for Site-Specific Marine Ecosystem Radiological Impact Analysis	Eliza B. Enriquez	Thailand	22 – 26 Feb'10	IAEA
Nuclear Safety Research Association (NSRA) Meeting on Nuclear Safety Cooperation	Vangeline K. Parami	Japan	24 – 26 Feb'10	Cabinet Office of Japan
6th Information Technology Support Group Meeting	Angel Anden	Austria	3 – 5 March'10	IAEA
IAEA Technical Meeting on the Nuclear Security Series Recommendations Document : Detection of and Response to Nuclear Security Events	Julietta E. Seguis	Austria	8 – 12 March'10	IAEA
Regional Radiological Security Partnership Review Meeting on Radioactive Source Security	Teofilo V. Leonin, Jr. Sylvia S. Busine	Viet nam	9 – 11 March'10	IAEA
11th Coordinators Meeting of the Forum for Nuclear Cooperation in Asia (FNCA)	Alumanda M. Dela Rosa	Japan	11 – 12 March'10	Gov't of Japan
Meeting on Scientific Advisory Committee of the International Atomic Energy Agency	Elvira Z. Sombrito	USA	23 – 26 March'10	IAEA
International Radioactive Waste Technical Committee Meeting (WATEC)	Alumanda M. Dela Rosa	Austria	16 – 19 March'10	IAEA
IAEA Final Coordination Meeting of the Project RAS/3/2009 Entitled "Strengthening Infrastructure for Radioactive Waste Management"	Editha A. Marcelo	Vietnam	22 – 26 March'10	IAEA
Meeting of Working Group for Regional Cooperative Framework (RCF)	Alumanda M. Dela Rosa	Austria	25 – 26 March'10	IAEA

Nuclear Security Summit	Alumanda M. Dela Rosa	USA	12 – 13 April'10	DOST
IAEA National Coordinators Meeting on Area Wide Management of Fruit Fly Pests	Glenda B. Obra	Oman	12 – 14 April'10	IAEA
3rd Meeting of the Nuclear Safety Strategy Dialogue (NSSD)	Alumanda M. Dela Rosa	Indonesia	22 – 23 April'10	IAEA
IAEA National Consultants Meeting on Improving Integrated Management Systems for Nuclear Power Plants (NPPs)	Corazon C. Bernido	Austria	3 – 7 May '10	IAEA
Consultants Meeting to Review and Adopt Guidelines on Audit and Accreditation of Food Irradiation Facilities	Zenaida M. De Guzman	Indonesia	10 – 14 May '10	IAEA
11th Asian Nuclear Safety Network (ANSN) Steering Committee Meeting	Corazon C. Bernido	Austria	26 – 28 May '10	IAEA
Second Regional Coordination and Planning Meeting on Development of Technical Capabilities for the Protection of Health and Safety of Workers Exposed to Ionizing Radiation	Estrella S. Caseria	Qatar	31 May – 3 Jun'e 10	IAEA
Meeting of the Asia-Pacific Safeguards Network (APSN)	Julietta E. Seguis and Sylvia S. Busine	Indonesia	2 – 4 June '10	ASNO
International Meeting on Human Resources Development (HRD) for Nuclear Energy	Alumanda M. Dela Rosa Percedita T. Cansino	Japan	3 – 4 June '10	IAEA Govt. of Japan
5th Standing Advisory Group on Technical Assistance and Cooperation (SAGTAC)	Alumanda M. Dela Rosa	Austria	14 – 18 June' 10	IAEA
Consultancy Meeting on Tenders Evaluation	Elvira Z. Sombrito	Austria	21– 25 June '10	IAEA
Regional Coordination Meeting on Strengthening Capabilities for Protection of the Public and the Environment from Radiation Practices	Vangeline K. Parami	Thailand	21– 25 June '10	IAEA
Regional Coordination Meeting of RAS/0053 on Providing Decision Support for Nuclear Power Plant and Development	Christina A. Petrache	Austria	23 – 25 June '10	IAEA
Annual Meeting of the Government and Regulatory Infrastructure Topical Group	Maria Visitacion B. Palattao	Viet Nam	6 – 9 July '10	IAEA
2nd Meeting of the "Study Panel on the Approaches Toward Infrastructure Development for Nuclear Power"	Corazon C. Bernido	Republic of Korea	1 – 2 July '10	Govt. of Japan
IAEA/RCA Midterm Progress Review Meeting of the RCA Project "Supporting Radiation Processing of Polymeric Materials for Agricultural Applications and Environmental Remediation"	Lucille V. Abad	Malaysia	19 – 23 July '10	IAEA
Regional Coordination Meeting on Supporting Web-Based Nuclear Education and Training Through Regional Networking	Corazon C. Bernido	Austria	21 – 23 July '10	IAEA
IAEA/RCA Midterm Progress Review Meeting on the "Applications Of Advanced Industrial Radiography and Tomography in Industry and Civil Engineering	Renato T. Bañaga	Viet Nam	2 – 6 Aug '10	IAEA
35th Session of the Working Group B - Preparatory Commission for the Comprehensive Nuclear Test-Ban Treaty Organization (CTBTO)	Teofilo Y. Garcia	Austria	16 Aug – 3 Sept '10	CTBTO
First Technical Meeting on the Development of Irradiated Foods for Immuno- Compromised Patients and Other Potential Target Groups	Zenaida M. De Guzman	Austria	23 – 27 Aug '10	IAEA
Midterm Review Meeting of the Regional Cooperative Agreement (RCA) Project on Enhancing Sanitary and Phytosanitary Treatment of Regional Products	Zenaida M. De Guzman	Austria	30 Aug – 3 Sept '10	IAEA
2nd Technical Meeting on Nuclear Security Objectives and Fundamental Principles	Julietta E. Seguis	Austria	30 Aug – 2 Sept '10	IAEA

Design and Formulation Meeting on a Large Scale Project on Management of Hazardous Algal Blooms	Rhett Simon DC. Tabbada	New Zealand	30 Aug – 3 Sept '10	IAEA
Technical Meeting on "Conversion of Miniature Neutron Source Reactors (MNSR) to Low-Enriched Uranium (LEU) Fuel Design and Spent Fuel Shipment."	Christina A. Petrache	China	13 – 16 Sept '10	IAEA
RCARO Meeting and Chair's Meeting 39th RCA General Conference Meeting IAEA : Senior Regulators Meeting	Alumanda M. Dela Rosa	Austria	16 – 24 Sept '10	IAEA
5th Annual Meeting on the Radioactive Waste Management Topical Group (RWMTG) and the Workshop on the Joint Convention Including a Supporting Internet-Based System for Data Reporting	Editha A. Marcelo and Maria Visitacion B. Palattao	Japan	27 Sept – 1 Nov '10	IAEA
Technical Meeting on Three Nuclear Security Series Recommendations Documents	Julietta E. Seguis	Austria	27 Sept – 1 Nov '10	IAEA
Plenary Meeting of the Center of Excellence in Low-Level Waste Disposal (DISPONET)	Alfonso A. Singayan	Germany	28 – 30 Sept '10	IAEA
Regional Meeting/Workshop on Impact of Organizational Changes on Integrated Management System	Alan Borras Ma. Celerina M. Ramiro	Bulgaria	28 – 30 Sept '10	IAEA
Mid Term Progress Review Meeting on Diagnosing Industrial Multiphase Systems by Process Visualization Using Radiotracers	Denis D. Aquino	Myanmar	4 – 8 Oct '10	IAEA
Asia and the Pacific National Division Officers Meeting	Alumanda M. Dela Rosa Nydia C. Medina	Austria	11 – 15 Oct '10	IAEA
Asia and the Pacific National Liaison Officers Meeting	Alumanda M. Dela Rosa	Austria	11 – 15 Oct '10	IAEA
IAEA/RCA Meeting of the Asia ALARA Network on Occupational Exposure in Medical Applications	Estrella S. Caseria	Australia	12 – 16 Oct '10	IAEA
12th Asian Nuclear Safety Network (ANSN) Steering Committee Meeting	Corazon C. Bernido	China	20 – 22 Oct '10	IAEA
Consultancy Meeting on Research Reactor Coalitions and Users Network: Education, Science and Application with Neutron Beams in East Asia - Pacific Region	Pablo P. Saligan	Republic of Korea	27 – 29 Oct '10	KAERI
Technical Meeting on Standardizing Curricula for Nuclear Power and Non-Power Applications to Support Human Resource Development Programmes in Nuclear Science and Technology	Corazon M. Garcia	Austria	27 – 29 Oct '10	IAEA
Project Coordination Meeting for "Improving Integrated Management Systems for Nuclear Power Plants	Corazon C. Bernido	China	8 – 12 Nov '10	IAEA
11th Ministerial Meeting of the Forum for Nuclear Cooperation in Asia (FNCA)	Alumanda M. Dela Rosa	China	17 – 18 Nov '10	FNCA
Mid-Term Progress Review Meeting of the Regional Cooperative Agreement (RCA) Project on Harmonizing Nuclear and Isotopic Techniques For Marine Pollution	Adelina DM. Bulos	Malaysia	22 – 26 Nov '10	IAEA
Regional Meeting on Self-Assessment Against International Atomic Energy Agency (IAEA) Safety Guide DS416	Thelma P. Artificio	Syrian Arab Republic	21 – 25 Nov '10	IAEA
Regional Meeting on Exploring Possibilities for Regulatory Harmonization	Vangeline K. Parami Alan M. Borras	Austria	22 – 24 Nov '10	IAEA
Regional Meeting on Self-Assesment Against International Atomic Energy Agency (IAEA) Safety Guide DS416	Vangeline K. Parami Thelma P. Artificio	Syrian Arab Republic	6 – 8 Dec '10	IAEA
Technical Meeting on the Development of the Global Nuclear Safety and Security Network (GNSSN) and the International Regulatory Network (REGNET).	Teofilo V. Leonin, Jr.	Austria	6 – 8 Dec '10	IAEA

Sub-Regional Meeting on Nuclear Security Information Management and Coordination	Julietta E. Seguis and Sylvia S. Busine	Australia	7 – 10 Dec '10	IAEA
CONFERENCE/CONGRESS/ SYMPOSIUM/FORUM				
11th International Export Control Conference	Alumanda M. Dela Rosa	Ukraine	8 – 10 June '10	
8th Flora Malesiana Symposium	Fernando B. Aurigue	Singapore	23 – 27 Aug '10	PHSI and CSSP
• 54th Regular Session of General Conference of the IAEA • Scientific Forum on Fighting Cancer In Developing Countries • Roundtable Discussion on Future Enhancement of Global and Regional Knowledge Networks	Alumanda M. Dela Rosa	Austria	16 – 24 Sept '10	IAEA
National Expert Mission - 8th International Symposium on Fruits of Economic Importance	Glenda B. Obra	Spain	26 Sept – 1 Nov '10	IAEA
2nd International Project on Innovative Nuclear Reactors and Fuel Cycles Dialogue Forum on Nuclear Energy Innovations: Multilateral Approaches to Sustainable Nuclear Energy Deployment	Christina A. Petrache	Austria	4 – 7 Oct '10	IAEA
International Conference on Challenge Faced by Technical and Scientific Support Organizations in Enhancing Nuclear Safety and Security	Alumanda M. Dela Rosa	Japan	14 – 19 Feb '10	IMO
International TSO Conference and Regional Meeting on 21st Century Capacity Building and Virtual Technical and Scientific Support Organization (TSO)	Alumanda M. Dela Rosa Ryan U. Olivares Rhett Simon DC Tabbada and Rolando Y. Reyes	Japan	29 Oct '10	IAEA– ANSN
SCIENTIFIC VISIT/EXPERT MISSION/CONSULTANCY				
37th Session of Group of Experts on Scientific Aspects of Marine Environmental Protection	Elvira Z. Sombrito	Thailand		IMO
Assessment Mission of National Capabilities for the Implementation of the Receptor Binding Assay	Elvira Z. Sombrito	Cuba, Venezuela and Colombia	11 – 19 March '10	IAEA
Radiation Processing and Applications	Haydee M. Solomon	Poland, Hungary	1 March – 31 May '10	IAEA
Scientific Visit to Various Laboratories to Observe Irradiation Quarantine Treatment Procedures on Tropical Fruits	Glenda B. Obra	USA	15 – 19 March '10	IAEA
Scientific Visit to Electron Beam Irradiation Facilities	Rosalino B. Rejas	Malaysia and Korea	3 – 7 May '10 10 – 19 May '10	IAEA
Technical Visit at the Radiation Grafting Laboratory of the Malaysian Nuclear Agency	Lucille V. Abad	Malaysia	26 July '10	IAEA
Scientific Visit to the Texas A & M University, National Center for Electron Beam	Zenaida M. De Guzman	USA	8 – 19 Nov '10	IAEA
Research Visit to the Electron Beam Irradiation Processing Facility Of IOTRON Technologies Corporation	Zenaida M. De Guzman	Canada	22 – 23 Nov '10	IAEA
Scientific Visit In Connection with the IAEA Technical Cooperation Project On "Upgrading the Secondary Standards Dosimetry Laboratory (SSDL)	Estrella S. Caseria	Greece Austria	22 – 26 Nov '10 29 Nov – 3 Dec '10	IAEA
NUCLEAR RESEARCHERS EXCHANGE PROGRAM				
MEXT Nuclear Researchers Exchange Program 2010	Preciosa Corazon B. Pabroa	Japan	4 Oct – 17 Dec '10	Govt. of Japan through MEXT
DEGREE COURSE				
Doctoral Program in Environmental Science Doctoral Program in Nuclear Engioneering and Management	Ryan U. Oliveros Lucille V. Abad	Japan Japan	16 Jan – 27 March '10 ???	Yamada Osamitsu Scholarship Foundation The University of Tokyo

TABLE 11. PNRI HUMAN RESOURCES DEVELOPMENT (LOCAL) IN 2010

FIELD	NAME	DATE	VENUE
TRAINING			
National Training Seminar on Additional Protocol Implementation for the Philippines	Corazon C. Bernido, Victoria Fe O. Medina, Teofilo V. Leonin, Jr., Vangeline K. Parami, Julietta E. Seguis, Leonardo S. Leopando, Ma. Visitacion B. Palattao, Edgar G. Racho, Luvimina G. Lanuza, Nydia C. Medina, Zenaida M. De Guzman, Lopito A. Caluag, Sylvia S. Busine, Ma. Teresa A. Salabit and Nelson P. Badinas	28 June – 2 July '10	PNRI
CBRN First Responder Training Program	Cecilia M. De Vera	27–30 Sept '10	Camp Crame, Quezon City
PhilGEPS Training	Joan L. Tugo	26–29 Oct '10	EARIST, Sta. Mesa, Manila
Supervisory Development Course	Soledad S. Castañeda	26–29 Oct '10	CSC, Quezon City
E-Learning Course on Total Quality Management System for the Service Sector	Alan M. Borras	12–15 Oct '10	Asian Institute of Management, Makati City
SEMINAR/WORKSHOP			
Seminar-Workshop on Gender Sensitivity and Gender Responsive Planning and Budgeting	Victoria Fe O. Medina, Ma. Celerina M. Ramiro, Celestino M. Santos, Bernard M. De Lara, Carolina M. Andres, Susan S. Pascual, Emma L. Cancino, Josefina J. Omandam, Laura R. Pineda, Avelina G. Lapade, Zenaida M. De Guzman, Teofilo Y. Garcia, Neil Raymund D. Guillermo, Adelina DM. Bulos, Soledad S. Castañeda, Ma. Luz M. Ascaño, Christina A. Petrache, Leonardo S. Leopando, Renato T. Bañaga, Luvimina G. Lanuza, Ana Elena L. Conjares, Percedita T. Cansino, Estrella S. Caseria, Rhodora R. Leonin, Isabel M. Amiscaray, Ma. Visitacion B. Palattao, Vangeline K. Parami, Edgar G. Racho, Teofilo V. Leonin, Jr., and Julietta E. Seguis	21–22 Jan '10	PNRI
Test Analysis and Calibration Information System at DOST (TACIS) SAD Workshop	Angel B. Anden	21 Jan '10	DOST
Meeting-Workshop on Government R & D Database	Ana Elena L. Conjares and Ma. Celerina M. Ramiro	22 Jan '10	ASTI
RPE Workshop and Hands on Training Session for Administrative Support Staff	Soledad S. Castañeda and Grace M. Carlos	25 Jan '10	Traders Hotel
License Processing and Infrastructure Development Workshop	Julietta E. Seguis, Alan M. Borras and Teresita G. De Jesus	– 1 Feb '10	EDSA Shangri-La Hotel
Nuclear Power Seminar for Non-Technical Personnel	Virginia B. Millano, Michael P. Hernandez, Cecilia T. Perez, Joan L. Tugo, Hidie S. Gocuyo, Flora C. Isip, Marife R. Roa, Jennylyn C. Minglana, Ricky C. Gabinete, Dante Q. Bajet, Glenda J. Nohay, Ryan A. Mi-ot	10 March '10	PNRI
Seminar-Workshop on Electronic Updating of the Personnel Services and Plantilla of Personnel	Alicia F. Lagunzad and Nelia M. Montilla	17– 19 March '10	Venis Hotel, Baguio City
Capacity Building Workshop on Stakeholder Communication for the Inter-Agency Core Group on Nuclear Energy	Victoria Fe O. Medina, Rhodora R. Leonin, Justina S. Cerbolles, Ma. Clerina M. Ramiro, Grace M. Carlos, Joseph R. Tugo, Josefina G. Natera	2– 5 May '10	NPC, Bagac, Bataan
Product Awareness Seminar on Integrated Payroll Master Government Edition	Bernard M. De Lara, Alicia F. Lagunzad and Christine P. Singayan	21 June '10	DBM, Manila
Seminar on Sustaining Laboratory Accreditation	Soledad S. Castañeda and Chitho P. Feliciano	5– 9 July '10	Cebu City
Seminar on Property and Supply Management Systems (PSMS)	Susan S. Pascual	22– 25 June '10	Commission on Audit Quezon City

Seminar/Workshop on ISO 9001:2008 Awareness	All PNRI Nuclear Regulatory Division Personnel, Division Personnel All Billing and Collection Personnel, Motorpool Unit Personnel Unit Property & Procurement Unit IMS Committee Members	5– 6 July '10	PNRI
Leadership Seminar	Soledad S. Castañeda, Estrella S. Caseria, Luvimina G. Lanuza, Celia O. Asaad, Preciosa Corazon B. Pabroa	17 Aug '10	Philippine Trade and Training Center, Pasay City
Seminar on Law & Rules on Government Expenditures (LARGE)	Gerald D. Conise	21– 24 Sept '10	Commission on Audit Quezon City
Workshop on Emergency Warning & Broadcast System	Cecilia M. De Vera Luzviminda L. Venida	6– 7 Sept '10	Crown Regency Hotel Pasig City
MEETING			
77th NRCP General Membership Assembly Meeting	Corazon C. Bernido, Graceta DL. Cuevas, Christina A. Petrache, Juana S. Gregorio, Glenda B. Obra, Rolando Y. Reyes, Ana Maria S. Veluz, Fernando B. Aurigue	10 March '10	Manila Hotel
Meeting for DOST Clients and Partners Database	Ana Elena L. Conjares	1 March '10	ASTI
Meeting for the DOST Facilities and Equipment Information System	Ana Elena L. Conjares	2 March '10	ASTI
DOST Test Analysis and Calibration Information System (TACIS) – TWG and ASTI 62nd Meeting	Angel B. Anden	Once a month starting Aug '10 – Dec '10	
Scientific Session & Organization Meeting of the Division of Chemical Sciences of the National Research Council of the Philippines	Soledad S. Castañeda, Preciosa Corazon B. Pabroa, Raymond J. Sucgang, Ryan P. Morco	20 Sept '10	University of the Philippines, Los Baños, Laguna
OTHERS			
71st PIChe National Convention	Soledad S. Castañeda, Preciosa Corazon B. Pabroa, Raymong J. Sucgang, Joseph Michael D.Racho, Norman DS. Mendoza	17–19 Feb '10	DAP, Tagaytay
Annual Convention of the Philippine Radiation Oncology Society (PROS)	Vangeline K. Parami, Thelma P. Artificio	17–18 Feb '10	SM Mall of Asia, Pasay City
10th SCA Conference	Zenaida M. De Guzman	14–16 June '10	Heritage Hotel, Pasay City
6th GSIS Members Conference	Lopito A. Caluag, Elizabeth C. Vidal, Alicia F. Lagunzad, Gerald D. Conise, Ma. Teresa A. Salabit, Michael P. Hernandez, Paolo Tristan F. Cruz, Christine P. Singayan	22 June '10	GSIS, Pasay City
11th National Forum on Health Research for Action	Christina A. Petrache, Zenaida M. De Guzman	29–30 July '10	Century Park Hotel
16th Annual BEENET Conference and Technofora	Chitho P. Feliciano	18–22 Aug '10	Davao City
PhilippineWaterworks Association, Inc. 18th International Conference and Exhibition	Soledad S. Castañeda	13–15 Oct '10	Boracay

TABLE 12. PNRI GRADUATE PROGRAM IN 2010

NAME/ADDRESS/E-MAIL OF SCHOLAR	LEVEL FIELD OF STUDY	NAME OF RECEIVING HIGHER EDUCATIONAL INSTITUTION	STATUS
WITH SCHOLARSHIP			
Lucille V. Abad	Ph. D. in Nuclear Engineering and Management	The University of Tokyo	Graduated/Japan Scholarship Program
Ryan U. Olivares	Ph.D. in Environmental Science	The University of Tokyo	On- Going/Asian Development Bank and Japan Scholarship Program
Preciosa Corazon B. Pabroa	Ph.D. in Environmental Science	University of the Philippines (UP) -Diliman	On-going/Science Education Institute (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	UP-Diliman	On-going
Vallerie Ann I. Samson	Ph.D. in Material Science Engineering	University of Tsukuba Monbukagakusho Scholarship	On-going
Chitho P. Feliciano	M.S. in Microbiology and Biotechnology	UP- Diliman	On-going
Lorna Jean H. Palad	M.S. Environmental Science	UP- Diliman	On-going
Rhett Simon DC. Tabbada	M.S. in Marine Science	UP- Diliman	On-going

Table 13. ADDITIONAL RESOURCES GENERATED THROUGH LOCAL GRANTS-IN-AID SOURCES IN 2010

DONOR NAME OF INSTITUTION	PROJECT TITLE	PROJECT LEADER/E-MAIL	DESCRIPTION OF ASSISTANCE	VALUE OF ASSISTANCE
Department of Science and Technology (DOST)/Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD)	Varietal Improvement of Ornamental Crops	Fernando B. Aurigue	Financing	503,591.00
DOST - Philippine Council for Health Research and Development (PCHRD)	Semi-Commercialization of PVP Carrageenan Hydrogel	Lucille V. Abad	Financing	1,524,592.00
Plaridel, Bulacan/ Baliuag/Calumpit	Bulacan Groundwater System	Soledad S. Castañeda	Financing	148,400.00
Department of Environment and Natural Resources (DENR)- Environmental Management Bureau- (EMB)	PM_{10} - $PM_{2.5}$ Monitoring and Source Apportionment in NAMRIA and POVEDA.	Preciosa Corazon B. Pabroa	Financing	3,733,139.00
DOST- Philippine Council for Industry and Energy Research and Development (PCIERD)	Ecology and Oceanography of Harmful Algal Blooms (HABS)	Efren Sta. Maria	Financing	4,233,060.00
DOST	Gamma Labelling of Toxin	Adelina DM. Bulos	Financing	1,000,500.00
DOST	Assessment of Radiological Impact	Teofilo Y. Garcia	Financing	1,250,000.00
DOST	Personnel Monitoring of Occupationally Exposed Radiation Workers	Estrella S. Caseria	Financing	1,000.000.00
DOST	Establishment, Implementation/ Upgrading of Facilities of DOST RDIs	Ma. Celerina M. Ramiro	Financing	15,234,598.00
DOST- PCIERD	Establishment, Implementation and Maintenance/ISO/IEC17025	Soledad S. Castañeda	Financing	1,578,472.00
DOST	Engaging Industry Partners in Business Opportunities	Ma. Celerina M. Ramiro	Financing	50,000.00
DOST	NSTW Documentation and Feedback/Impact Assessment	Rhodora R. Leonin	Financing	260,000.00
DOST-Technology Application and Promotion Institute	Fabrication and Production of PNRI's Exhibit and Print Materials for the 2010 National Science and Technology Fair Exhibits	Rhodora R. Leonin	Financing	140,000.00

DOST	Additional Maintenance and Other Operating Expenses		Financing	603,000.00
	Revalidation of Reverted Agency Balance of 16 Projects	Reverted balance from year 2009	Financing	25,277,979.00
DOST	Hosting of the 32nd National Regional Cooperative Agreement (RCA)	Victoria Fe O. Medina	Financing	489,500.00
Department of Agriculture- Bureau of Plant Industry	Enhancement of Export Competitiveness	Glenda B. Obra	Financing	207,246.00
				TOTAL: 62,234,076.32

TABLE 14. LIST OF SCIENTIFIC PUBLICATIONS IN 2010

TITLE OF SCIENTIFIC PAPER	NAME/E-MAIL OF AUTHORS	PUBLICATION/ NAME/ TYPE OF JOURNAL*	DATE PUBLISHED
A Comparative Study of Thorium Activity in NORM and High Background Radiation Area	S.K. Sahoo, T. Ishikawa, S. Tokonami, A. Sorimach, C. Kranrod, M. Janik, M. Hosoda, N. Hassan, S. Chanyotha, V. K. Parami, Yonehara, and R. C. Ramola	Radiation Protection Dosimetry (2010) pp 1-4, doi, 10.1093/rpd/ncq239 (Radiation Protection Dosimetry Advance ACCESS.	16 Sept ' 2010
Accurate Determination of Naturally Occurring Radionuclides in Philippine Coal-fired Thermal Power Plants Using Inductively Coupled Plasma Mass Spectrometry and Gamma-Spectroscopy	Vangeline K. Parami, Sarata Kumar Sahoo, Hidenori Yonehara, Shino Takeda, Leni L. Quirit	Microchemical Journal, 95 (2010), 181–185.	2010
Dynamic Modelling of Pollutant Transport from Landfill Leachate Along Affected Surface Water	Soledas S. Castañeda	Proceedings of the PWWA 1st International Conference and Exhibition (Philwater 2010). Philippine Waterworks Association, Inc.	October 2010
PNRI Mutant Variety: Freycinetia multiflora 'Golden Stairs'	Fernando B. Aurigue fbaurigue@pnri.dost.gov.ph	Philippine Nuclear Journal, Vol 15 pp 1– 4	2010
Profiling of Olihosaccharides and P53 Gene Mutation in Filipino Breast Tumors	Custer C. Deocaris, Jose Donato A. Magno, Michael Joseph B. Cruz, Abelardo – Alan T. Prodigalidad, Azucena C, De Vera and Sonia D. Jacinto	Philippine Nuclear Journal, Vol 15, pp 5–14	2010
Low-Level Tritium Measurement in Freshwater Sources in the Philippines Using Electrolytic Enrichment and Liquid Scintillation Spectrometry	Norman DS. Mendoza, Raymond J. Sucgang and Soledad S. Castañeda	Philippine Nuclear Journal, Vol 15, pp 15 –22	2010
Natural Radioelement Mapping by Carborne and Ground Gamma Ray Spectrometry in the Philippines	Rolando Y. Reyes, Christina A. Petrache, Estrellita U. Tabora and Teofilo Y. Garcia	Philippine Nuclear Journal, Vol 15, pp 23 –34	2010
Elemental Characterization of Inhalable Particulate Emissions on New Year's Day in Metro Manila	Flora L. Santos, Preciosa Corazon B. Pabroa, Ryan P. Morco, and Joseph Michael D. Racho	Philippine Nuclear Journal, Vol 15, pp 35 –41	2010

List of Abbreviations

ANSTO	Australian Nuclear Science and Technology Organization
ANSN	Asian Nuclear Safety Network
ASNO	Australia Safeguards and Non Proliferation Office
ASTI	Advanced Science and Technology Institute
CTBTO	Comprehensive Nuclear -Test- Ban Treaty Organization
CSSP	Cactus and Succulent Society of the Philippines
DOST	Department of Science and Technology (Philippines)
FNCA	Forum for Nuclear Cooperation in Asia
IAEA	International Atomic Energy Agency
IMO	International Maritime Organization
KAERI	Korea Atomic Energy Research Institute
kGY	**kilogray**
MEXT	Ministry of Education, Culture and Sports, Japan
PAGASA	Philippine Atmospheric , Geophysical and Astronomical Services Administration
PHIVOLCS	Philippine Insitute of Volcanology and Seismology
PHS	Philippine Horticultural Society
PNNL	Pacific Northwest National laboratory
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
US DOE	United States Department of Energy

Organization

DIRECTOR

DEPUTY DIRECTOR

PLANNING

TECHNICAL ASSISTANCE

ATOMIC RESEARCH DIVISION

- Agricultural Research
- Biomedical Research
- Health Physics Research
- Applied Physics Research
- Chemistry Research
- Analytical Measurements Research
- Isotope Techniques Research
- Nuclear Materials Research

NUCLEAR SERVICES AND TRAINING DIVISION

- Reactor Operations
- Engineering Services
- Irradiation Services
- Nuclear Training Center
- Computer Services
- Radiation Protection Services
- Information Services
- Library Services

NUCLEAR REGULATIONS, LICENSING AND SAFEGUARDS DIVISION

- Standards Development
- Inspection and Enforcement
- Licensing, Review and Evaluation
- Safeguards
- Radiological Impact Assessment

FINANCE AND ADMINISTRATIVE DIVISION

- Finance and Property Section
  - Budget Unit
  - Accounting Unit
  - Cash Unit
  - Property and Procurement Unit
- Personnel Services Section
  - Personnel Unit
  - Records and Communication Unit
  - Medical Unit
- General Services Section
  - Plant Services Unit
  - Motorpool Unit

PNRI Officials

Alumanda M. dela Rosa, Ph.D.
DIRECTOR

Corazon C. Bernido, Ph.D.
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Soledad S. Castañeda, MSc *
CHIEF, ATOMIC RESEARCH DIVISION

Christina A. Petrache, Ph.D. **
OFFICER-IN-CHARGE
NUCLEAR SERVICES AND TRAINING DIVISION

Teofilo V. Leonin, Jr., MSc
OFFICER-IN-CHARGE
NUCLEAR REGULATIONS,
LICENSING AND SAFEGUARDS DIVISION

Graceta DL. Cuevas, DPA
FINANCE AND ADMINISTRATIVE DIVISION

NOTE: * Chief, ARD *(starting November 11, 2010)*
** Chief, NSTD *(starting November 22, 2010)*