Laporan Tahunan 2012

Annual Report

Agensi Nuklear Malaysia ● *Malaysian Nuclear Agency*, MOSTI

Senarai KANDUNGAN
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Sains dan teknologi nuklear untuk penjanaan ilmu, kemakmuran dan kesejahteraan masyarakat dan negara

Misi

Meneraju kecemerlangan dalam penyelidikan dan penggunaan teknologi nuklear untuk pembangunan lestari

Objektif

Menjana produk dan teknologi baru melalui penyelidikan dan inovasi berdasarkan agenda pembangunan negara

Mencapai sasaran minimum 30% dari bajet mengurus tahunan, menerusi pemindahan dan pengurusan pengkomersilan teknologi

Meningkatkan kecemerlangan organisasi melalui perancangan dan pengurusan kualiti

Vision

Nuclear science and technology for knowledge generation, wealth creation, and societal and national well-being

Mission

Excellence in research and applications of nuclear technology for sustainable development

Objectives

To generate new products and technologies through research and innovation based on the national development agenda

To achieve an income, at minimum 30% of the annual operating budget, through transfer and commercialisation of technology

To enhance organisational excellence through planning and quality management

PERUTUSAN MENTERI SAINS, TEKNOLOGI DAN INOVASI

MESSAGE FROM THE MINISTER OF SCIENCE, TECHNOLOGY AND INNOVATION

"Nuklear Malaysia berjaya mengaplikasi teknologi yang dibangunkan bagi memperkasa sosioekonomi masyarakat luar bandar dengan mewujudkan peluang pekerjaan dan meningkatkan pendapatan."

Pada tahun 2012, genap 40 tahun Agensi Nuklear Malaysia (Nuklear Malaysia) menerajui dan mendokong aspirasi negara untuk pembangunan sains dan teknologi nuklear di Malaysia. Hasil usaha gigih yang berterusan dan tranformasi dalam penyelidikan, pembangunan dan pengkomersilan (R&D&C), agensi ini terus melangkah maju untuk menyumbang kepada peningkatan daya saing negara melalui output penyelidikan berimpak tinggi, kepakaran dan peningkatan teknologi tempatan. Nuklear Malaysia akan meneruskan komitmen untuk menambah baik program penyelidikan, khidmat teknikal dan pengkomersilan teknologi supaya sentiasa releven dengan aspirasi MOSTI dan dasar-dasar Kerajaan bagi menyokong hasrat menjadikan Malaysia sebagai negara maju.

Malaysia Nuclear Agency (Nuclear Malaysia) has leading and upholding the nation's aspirations in the development of nuclear science and technology in Malaysia for 40 years since 1972. This agency has played an important role towards enhancing the nation's competitiveness through high impact research output, the outcome of continuous effort and transformation in research, development and commercialisation (R&D&C). Nuclear Malaysia will continually strive to enhance its research programmes, provision of technical services and technology commercialisation to remain relevant with MOSTI's aspirations as well as the Government's policies to enable Malaysia to become a developed nation.

Sebagai sebuah agensi kerajaan, Nuklear Malaysia sentiasa menyumbang kepada program transformasi ekonomi berasaskan kepakarannya dalam penyelidikan sains dan teknologi nuklear. Inisiatif untuk memanfaatkan kepakaran dan teknologi nuklear untuk membantu masyarakat khususnya komuniti luar bandar telah dilaksanakan. Melalui sokongan dan geran kelolaan MOSTI seperti Community Innovation Fund (CIF), Grassroot Innovation Fund (GIF) dan Technology Application Project (TAP@MOSTI), Nuklear Malaysia berjaya mengaplikasi teknologi yang dibangunkan bagi memperkasa sosioekonomi masyarakat luar bandar dengan mewujudkan peluang pekerjaan dan meningkatkan pendapatan.

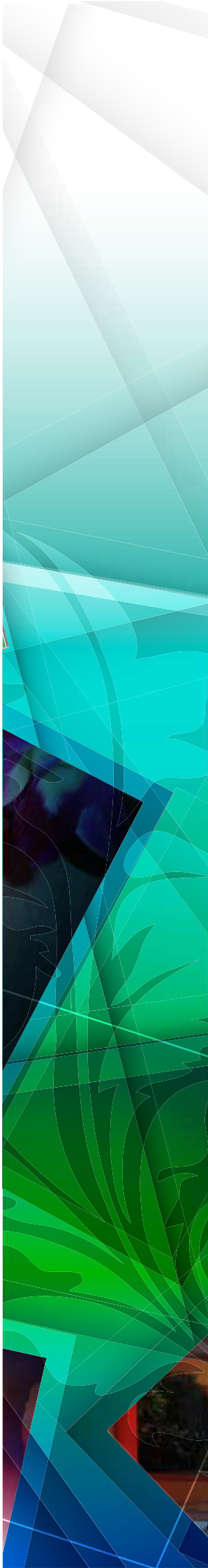
Selama empat dekad usaha memperkasa agensi ini dilaksanakan secara berterusan. Nuklear Malaysia telah mengambil peluang sepenuhnya keanggotaan di dalam Agensi Tenaga Atom Antarabangsa (IAEA) untuk pembangunan teknologi nuklear Negara melalui program kerjasama teknikal, pembangunan sumber manusia dan pemindahan teknologi sama ada di dalam mahupun di luar negara yang disertai secara aktif. Melalui program ini, penyelidik tempatan secara langsung dapat berkongsi maklumat, pengetahuan, teknologi dan pengalaman untuk pembangunan teknologi nuklear tempatan. Malaysia turut memberi sumbangan besar kepada kejayaan kerjasama teknikal di peringkat ASEAN dan Asia Pasifik dengan mengambil bahagian di dalam program kerjasama serantau, melaksanakan dan menjadi tuan rumah kepada program-program anjuran IAEA.

Nuklear Malaysia juga telah mengambil langkah proaktif sebagai sebuah agensi sokongan teknikal (TSO) di dalam perancangan program kuasa nuklear Negara sebagai pilihan penjanaan kuasa elektrik pasca 2020.Pelbagai aktiviti dijalankan melibatkan pembangunan keupayaan dan kemampuan warga kerja dalam aspek teknikal, perkongsian pengetahuan dan peningkatan sistem keselamatan dan pemantapan pengetahuan teknologi nuklear.

As government agency, Nuclear Malaysia has taken the initiative to utilise its expertise and technology to help society especially the rural community. Nuclear Malaysia is committed to apply technologies that are developed to help create job opportunities and increase the income of the rural communities through MOSTI's support and grants through the Community Innovation Fund (CIF), Grassroot Innovation Fund (GIF) and Technology Application Project (TAP@MOSTI).

Nuclear Malaysia has benefitted from its membership in the IAEA in the development of the nation's nuclear technology through technical cooperation programmes, human resources development and technology transfer. Nuclear Malaysia has actively participated technical collaborations, human capital development and technology transfer programmes at national and international levels so that local researchers would enhance their knowledge. Malaysia has made significant contribution at ASEAN and Asia Pacific levels through the participation of Nuclear Malaysia in these regional collaboration programmes and by organizing IAEAs' programmes.

Nuclear Malaysia has also taken proactive measures as a technical support agency (TSO) in National nuclear power program planning as electrical power generation option post 2020. Various activities has been conducted involving the development of workforce capacity and capability in technical aspects, knowledge sharing and increasing of security system and enhancing knowledge in nuclear technology.



Akhir kata, tahniah dan penghargaan dirakamkan kepada Nuklear Malaysia di atas sumbangan besar dan kecemerlangan yang di capai sepanjang tahun 2011. Saya menyeru Nuklear Malaysia untuk melipatgandakan lagi usaha untuk terus melangkah ke arah kegemilangan sebagai peneraju utama pembangunan sains dan teknologi nuklear.

Finally, I would like to deliver my warmest congratulations and appreciation to Nuclear Malaysia for the significant contributions and excellent outputs throughout 2012. I urge Nuclear Malaysia to intensify its effort and continue to move towards excellence as a leading in nuclear science and technology development in Malaysia.

Y.B Datuk Seri Panglima Dr Maximus Johnity Ongkili
Menteri Sains, Teknologi dan Inovasi Malaysia
Y.B Datuk Seri Panglima Dr Maximus Johnity Ongkili
Menteri Sains, Teknologi dan Inovasi Malaysia

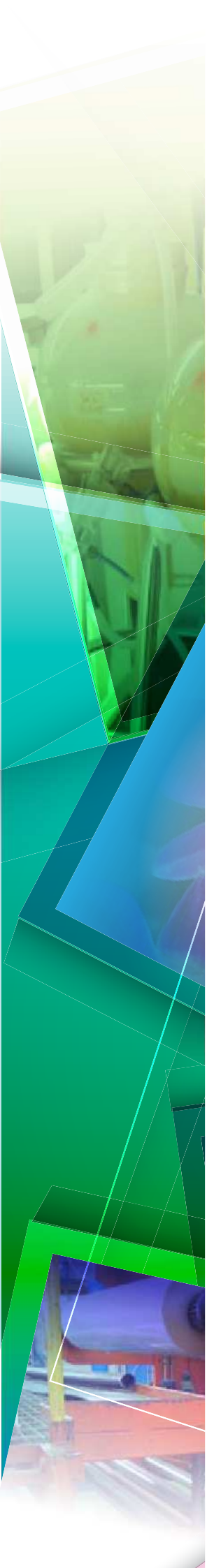
PERUTUSAN KETUA SETIAUSAHA KEMENTERIAN SAINS, TEKNOLOGI DAN INOVASI

MESSAGE FROM THE SECRETARY GENERAL MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION

" Kepakaran Nuklear Malaysia terbukti telah berjaya membantu Negara menangani pelbagai isu dan krisis membabitkan keselamatan radiologi di dalam dan luar Negara."

Nuklear Malaysia terus melakar kecemerlangan di dalam penyelidikan berasaskan sains dan teknologi nuklear . Kecemerlangan ini adalah hasil usaha gigih, kepakaran dan pengalaman genap 40 tahun sebagai peneraju di dalam bidang ini di Malaysia. Selama 40 tahun juga agensi ini telah bertindak secara proaktif bagi memperkasa bidang-bidang penyelidikannya berdasarkan bidang keutamaan negara. Objektif dan hala tuju agensi sentiasa diberi penekanan agar pencapaiannya selaras dengan sasaran dan hala tuju MOSTI. Sebagai sebuah agensi penyelidikan yang berpengalaman, Nuklear Malaysia berada di landasan yang tepat dengan melaksanakan program transformasi dan inovasi agensi secara menyeluruh membabitkan integrasi dan interaksi baik di peringkat perancangan, penggubalan dasar dan strategi, pelaksanaan mahupun pemantauan. Hasilnya, kepakaran dan sumber yang dimiliki agensi ini terbukti berjaya dioptimumkan untuk mencapai KPI yang ditetapkan .

Nuclear Malaysia continues to excel in science-based research and nuclear technology. This success is the result of hard work, expertise and even 40 years of experience as a leader in nuclear science and technology in Malaysia. For 40 years Nuclear Malaysia has taken proactive measures to strengthen its research based on the national key results areas. Emphasis is always placed on the objective and direction of the agency so that they are aligned with the goals and directions of MOSTI. As an experienced research agency, Nuclear Malaysia is on the right track by implementing the agency's transformation and innovation programmes holistically, involving integration and interaction at the various stages of planning, strategy and policy-making and implementation as well as monitoring.



Nuklear Malaysia terus melangkah ke hadapan dalam mempelbagaikan bidang penyelidikannya khususnya untuk pembangunan teknologi terbaru dan bidang penyelidikan yang berimpak tinggi. Agensi ini sedang bekerjasama dengan beberapa agensi kerajaan yang lain, institusi pengajian tinggi tempatan dan industri berkaitan dalam menjayakan kajian kebolehgunaan torium sebagai sumber bahan api nuklear untuk masa hadapan. Kajian ini penting memandangkan torium berpotensi sebagai bahan api untuk reaktor kuasa nuklear menggantikan uranium. Kajian ini juga mempunyai impak yang besar kepada Negara kerana Malaysia mempunyai sumber torium yang berpotensi untuk digunakan jika Malaysia menggunakan kuasa nuklear sebagai alternatif kepada penjanaan tenaga elektrik negara.

Kepakaran Nuklear Malaysia terbukti telah berjaya membantu Negara menangani pelbagai isu dan krisis membabitkan keselamatan radiologi di dalam dan luar Negara. Rentetan peristiwa gempa bumi dan tsunami di Jepun, Nuklear Malaysia telah mengambil beberapa langkah dalam menangani kecemasan bersama agensi lain seperti Lembaga Pelesenan Tenaga Atom (LPTA) akibat kemalangan reaktor kuasa nuklear di Fukushima. Pengalaman dan kepakarannya menjadi faktor agensi ini turut memberi keutamaan bagi meningkatkan keupayaan Sistem Pengurusan Keselamatan, Kesihatan dan Persekitaran (SHE-MS) dan kesiapsiagaan kecemasan radiologi dan nuklear. Perkhidmatan teknikal dan kepakaran dalam keselamatan dan kesihatan turut diberi penekanan bagi menjamin keselamatan pekerja, orang awam dan alam sekitar.

Inovasi merupakan penggerak utama pembangunan teknologi Negara. Sedar akan kenyataan ini, Nuklear Malaysia sentiasa proaktif merangka program untuk memastikan penyelidiknya sentiasa inovatif dan kreatif dalam menghasilkan penyelidikan yang mampu memberi impak kepada pembangunan Negara.

Nuclear Malaysia is moving forward in diversifying the particular field of research for the development of new technology and high-impact research. The agency is working with other government agencies, institutions of higher learning and related industries in a study on the viability of use of thorium as an energy source for future nuclear power generation in Malaysia. This study is important based on the potential of thorium as a nuclear fuel for the power reactors replacing uranium. This is a high-impact study as Malaysia has the potential thorium resource to use if we decide to use nuclear power as an alternative to the generation of electricity in the country.

Nuclear Malaysia expertise has helped our country to address various issues and crises involving radiological safety in and outside the country. Following the sequence of events of earthquake and tsunami in Japan, Nuclear Malaysia has taken several steps to address the emergency together with other agencies such as Atomic Energy Licensing Board (AELB) as a result of nuclear power reactor accident in Fukushima. Based on their experience and expertise priority is given to enhance Management System on Safety, Health and Environment (SHE-MS) and radiological and nuclear emergency preparedness. Technical services and expertise on safety and health are also emphasized to ensure the safety of workers, the public and the environment.

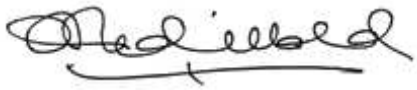
Innovation is the main driver for the National technology development. Nuclear Malaysia recognises the importance of innovation in achieving national goals. A number of proactive measures have been undertaken to produce a generation of innovative researchers.

MOSTI sentiasa memberi sokongan padu terhadap pelbagai program pembangunan modal insan serta penyertaan Nuklear Malaysia dalam pelbagai program inovasi di peringkat kebangsaan dan antarabangsa. Kementerian juga akan terus menyokong usaha-usaha Nuklear Malaysia untuk meningkatkan kapasiti dan kepakaran agensi ini dari segi infrastruktur penyelidikan dan modal insan.

Akhir kata, saya ingin merakamkan ucapan tahniah dan penghargaan kepada Nuklear Malaysia di atas sumbangan besar dan hasil kerja cemerlang sepanjang 40 tahun penubuhannya. Kegemilangan dan kecemerlangan yang dijayakan selama ini harus diteruskan.

MOSTI will continue to support training programmes, seminars and the participation of Nuclear Malaysia in various innovation programmes at national and international levels. MOSTI will also continue to support Nuclear Malaysia in enhancing its capacity and expertise in terms of research infrastructure and human capital.

Finally, I wish to express my gratitude and appreciation to the Nuclear Malaysia for their significant contributions and outstanding work during the 40 years of its inception. Glory and excellence accomplished should be continued.



Y. Bhg. Dato' Dr. Madinah Binti Mohamad
Ketua Setiausaha, Kementerian Sains, Teknologi Dan Inovasi
Y. Bhg. Dato' Dr. Madinah Binti Mohamad
Ketua Setiausaha Kementerian Sains, Teknologi Dan Inovasi

LAPORAN KETUA PENGARAH
REPORT BY THE DIRECTOR GENERAL

"Nuklear Malaysia kekal teguh sebagai organisasi yang diyakini dalam menerajui bidang nuklear, membolehkan organisasi menerima pelbagai pembiayaan untuk melaksanakan projek-projek R&D di peringkat kebangsaan dan antarabangsa."

Agensi Nuklear Malaysia terus bergerak cergas di dalam R&D dan khidmat teknikal bagi memastikan fungsinya sebagai peneraju teknologi nuklear Negara terus relevan dengan arus kemajuan ekonomi Negara. Pada tahun 2012, Nuklear Malaysia lebih proaktif dalam usaha melebarkan sayap pengkomersialan teknologi dengan menjalankan lebih banyak aktiviti turun padang agar mendapat hasil yang lebih berkesan.

Nuclear Malaysia has managed to maintain its excellence in nuclear science & technology and related technologies for 2012. This is achieved through various organisational consolidation programmes and activities in line with the Economic Transformation Programme based on the New Economic Model. Nuclear Malaysia also ensures that all the Agency's planned activities align with MOSTI's policies.

Nuklear Malaysia kekal teguh sebagai organisasi yang diyakini dalam menerajui bidang sains dan teknologi nuklear dan teknologi berkaitan, membolehkan organisasi menerima pelbagai pembiayaan untuk melaksanakan projek-projek R&D di peringkat kebangsaan dan antarabangsa. Agensi ini juga telah dilantik menerajui beberapa projek yang dibiayai oleh badan-badan antarabangsa seperti IAEA dan pembiayaan dari program kerjasama serantau.

Nuklear Malaysia berjaya menghasilkan output baru yang terdiri dari 22 produk, empat proses, lima perisian, lapan prosedur dan empat pangkalan data daripada perlaksanaan projek-projek R&D. Selain daripada itu, dalam usaha untuk melindungi harta intelek, sebanyak empat paten telah berjaya diperolehi. Penerbitan juga merupakan salah satu output penting dalam aktiviti R&D. Nuklear Malaysia telah menerbitkan sebuah buku dan menghasilkan 13 tesis, tiga bab dalam buku, 62 kertas untuk jurnal antarabangsa, 33 kertas untuk jurnal kebangsaan di samping 194 kertas kerja di peringkat antarabangsa dan kebangsaan.

Nuklear Malaysia juga amat komited di dalam pelaksanaan program-program komuniti yang di terajui oleh MOSTI. Nuklear Malaysia juga telah menyelia projek-projek komuniti yang dibiayai oleh MOSTI bertujuan untuk membantu masyarakat tempatan menggunakan teknologi moden. Nuklear Malaysia dilantik sebagai agensi pelaksana bagi tujuh entity dalam projek herbaponik di bawah Program TAPMOSTI.

Pada tahun 2012, Nuklear Malaysia meneruskan komitmennya di dalam pelaksanaan program pengkomersilan teknologi. Jumlah pendapatan yang dijana adalah sebanyak RM 14.61 juta melalui aktiviti bekalan produk, khidmat latihan, perkhidmatan teknikal, kontrak dan geran penyelidikan, runding cara dan dividen pelaburan. Nuklear Malaysia juga telah menandatangani dua perjanjian kerjasama, tiga perjanjian persefahaman serta sembilan Perjanjian Kerahsiaan (Non-Disclosure Agreement). Program Teknoprenur turut dilaksanakan bertujuan untuk menerapkan budaya komersil dalam kalangan penyelidik dengan tujuan dapat meningkatkan pengkomersilan hasil penyelidikan Nuklear Malaysia.

The stakeholder's confidence and trust in Nuclear Malaysia's capability to lead in the field of nuclear science & technology have enabled the Agency to acquire various grants to fund its national and international R&D projects. In addition, Nuclear Malaysia also leads a number of projects sponsored by the international bodies such as the IAEA and other regional cooperative programmes.

Nuclear Malaysia has successfully produced new outputs in the form of 22 products, four processes, five softwares, eight procedures and four data bases from the R&D projects carried out. In the effort to protect intellectual properties, Nuclear Malaysia has successfully obtained four patents. Another important output of R&D are the publications in which Nuclear Malaysia published a book, three chapters in books, produced 13 thesis, 62 papers in international and 33 papers in national journals as well as 194 papers presented at international and national levels.

Nuclear Malaysia is also committed in the implementation of community programmes initiated and anchored by MOSTI. Nuclear Malaysia also supervised community projects funded by MOSTI to help local communities use modern technologies. Nuclear Malaysia was appointed as implementing agency for seven entities in herbaponic projects under the TAPMOSTI Programme.

Nuclear Malaysia's commitment in its technology commercialisation programme for 2012 generated an income totalling RM 14.61 million through the provision of products, training and technical services, research contracts and grants, consultations and investment dividends. Nuclear Malaysia also signed two Memorandom of Agreements, three understanding agreements and nine Non-Disclosure Agreements. A Technopreneur Programme to inculcate entrepreneurial culture among researchers was also implemented with the aim of improving commercialisation of Nuclear Malaysia's research findings.

Selain daripada itu, Nuklear Malaysia turut menjalinkan kerjasama penyelidikan dan teknikal dengan institusi luar negara untuk penggunaan teknologi nuklear secara aman. Kerjasama ini dilaksanakan dalam bentuk bantuan pakar dan pembiayaan kewangan melalui program TC-IAEA, CRP, RCA dan FNCA.

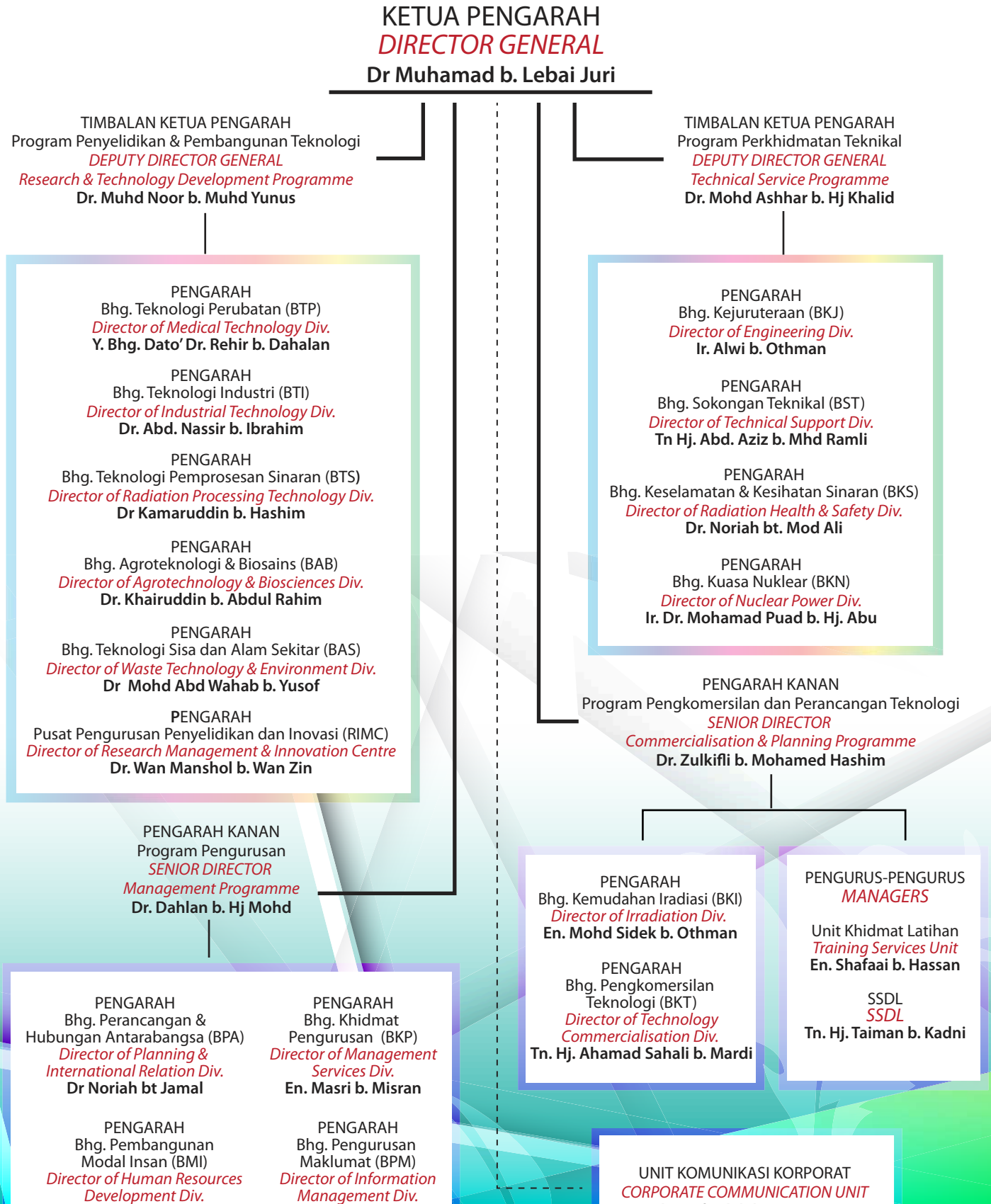
Nuklear Malaysia sentiasa peka dengan keperluan pihak industri dan Negara. Justru itu segala usaha digembleng bagi membuat penambahbaikan dalam penyelidikan, meninjau keperluan pasaran dan menambah nilai hasil produk agar dapat terus berdaya saing seiring dengan aspirasi MOSTI dan Negara.

Nuclear Malaysia also fostered research and technical cooperation in the peaceful applications of nuclear technology with international institutions. The various cooperation were accomplished in the form of technical aids and financial sponsorship through TC-IAEA, CRP, RCA and FNCA programmes.

Nuclear Malaysia has always been sensitive to the needs of the industry and the country. Thus, every effort is geared to make improvements in research, explore market needs and add value to products in order to remain competitive and in line with the aspirations of the National MOSTI

Dr. Muhamad b. Lebai Juri
Ketua Pengarah, Agensi Nuklear Malaysia
Dr. Muhamad b. Lebai Juri
Director General, Malaysian Nuclear Agency

CARTA ORGANISASI
ORGANISATIONAL CHART



Pengurusan Atasan
Top Management

Ketua Pengarah
Director General
DR MUHAMAD B. LEBAI JURI

Timbalan Ketua Pengarah
Penyelidikan & Pembangunan Teknologi
Deputy Director General Research & Technology Development Programme
DR. MOHD ASHHAR B. HJ KHALID

Pengarah Kanan Program Pengkomersilan dan Perancangan Teknologi
Senior Director of Commercialisation & Planning Div.
DR. ZULKIFLI B. MOHAMED HASHIM

Timbalan Ketua Pengarah
Program Perkhidmatan Teknikal
Deputy Director General Technical Service Programme
DR. MUHD NOOR B. MUHD YUNUS

Pengarah Kanan Program Pengurusan
Senior Director of Management Programme
DR. DAHLAN B. HJ MOHD

Program Penyelidikan Dan Pembangunan Teknologi
Research And Technology Development Programme

Timbalan Ketua Pengarah
Deputy Director General
DR. MUHD NOOR B. MUHD YUNUS

Pengarah Bhg. Teknologi Perubatan (BTP)
Director of Medical Technology Div.
Y. BHG. DATO' DR. REHIR B. DAHALAN

Pengarah Bhg. Teknologi Industri (BTI)
Director of Industrial Technology Div.
DR. ABD. NASSIR B. IBRAHIM

Pengarah Bhg. Teknologi Sisa dan Alam Sekitar (BAS)
Director of Waste Technology & Environment Div.
DR. MOHD ABD WAHAB B. YUSOF

Pengarah Bhg. Agroteknologi & Biosains (BAB)
Director of Agrotechnology & Biosciences Div.
DR. KHAIRUDDIN ABDUL RAHIM

Pengarah Bhg. Teknologi Pemprosesan Sinaran (BTS)
Director of Radiation Processing Technology Div.
DR. KAMARUDDIN B. HASHIM

Pengarah Pusat Pengurusan Penyelidikan dan Inovasi (RIMC)
Director of Research Management and innovation Centre
DR. WAN MANSHOL B. WAN ZIN

Program Perkhidmatan Teknikal
Technical Service Programme

Timbalan Ketua Pengarah
Deputy Director General
DR. MOHD ASHHAR B. HJ KHALID

Pengarah Bhg. Kejuruteraan (BKJ)
Director of Engineering Div.
IR. ALWI B. OTHMAN

Pengarah Bhg. Kuasa Nuklear (BKN)
Director of Nuclear Power Div.
IR. DR. MOHAMAD PUAD B. HJ. ABU

Pengarah Bhg. Sokongan Teknikal (BST)
Director of Technical Support
TN HJ. ABD AZIZ B. MHD RAMLI

Pengarah Bhg. Keselamatan & Kesihatan Sinaran (BKS)
Director of Radiation Health & Safety Div.
DR. NORIAH BT. MOD ALI

Program Pengurusan
Management Programme

Pengarah Bhg. Perancangan & Hubungan Antarabangsa (BPA)
Director of Planning & International Relation Div.
DR. NORIAH BT. JAMAL

Pengarah Bhg.Pengurusan Maklumat (BPM)
Director of Information Management Div.
TN HJ. IBERAHIM B. ALI

Pengarah Bahagian Pembangunan Modal Insan (BSM)
Director of Human Resources Development Div.
Y. BHG. DATIN DR ASIAH BT AHMAD

Bhg. Khidmat Pengurusan (BKP)
Director of Management Services Div.
EN. MASRI B. MISRAN

Pengarah Kanan
Senior Director
DR. DAHLAN B. HJ MOHD

Program Pengkomersilan Dan Pemindahan Teknologi
Commercialisation And Technology Planning Programme

Pengarah Bhg. Pengkomersilan Teknologi (BKT)
Director of Technology Commercialisation Div.
TN HJ. AHAMAD SAHALI B. MARDI

Pengarah Bhg. Kemudahan Iradiasi (BKI)
Director of Irradiation Div.
EN. MOHD SIDEK B. OTHMAN

Pengarah Kanan
Senior Director
DR. ZULKIFLI B. MOHAMED HASHIM

Diari Korporat

Corporate Diary

Januari/*January*

10-13

Kursus Susulan Persediaan Awal Kerjasama Pembangunan Modal Insan Dalam Bidang Tenaga Nuklear dan Sinaran antara Nuklear Malaysia dan JAE*A*

Follow-up Training Course (FTC) on Preparatory Work between Nuclear Malaysia and JAEA On Human Resources Development Cooperation In the Field of Nuclear Energy and Radiation, Bangi

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Lawatan delegasi dari Universiti Hasanudin, Indonesia

Visit by delegation from Hasanudin University, Indonesia

17-19

Bengkel Pelaksanaan Sistem Pengurusan Keselamatan Maklumat (ISMS), Bangi

Workshop on Implementation of Information Security Management System, Bangi

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Latihan Kesiapsiagaan Nuklear dan Radiologi, Bangi

Nuclear and Radiological Emergency Preparedness and Responses, Bangi

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Perhimpunan Pagi & Pelancaran Portal Jurnal Sains Nuklear Malaysia (JSNM), Bangi

Morning Assembly and Launching of JSNM Portal, Bangi

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Perhimpunan Pagi MOSTI dan Pelancaran Awal Tahun Sains dan Gerakan Inovasi Nasional 2012, Bangi

MOSTI Morning Assembly and Soft Launching of Science and Innovation Movement

Febuari/February

2-3

Bengkel Projek Top Down, Bangi

Workshop on Top Down Project , Bangi

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Majlis Menandatangani Kerjasama Nuklear Malaysia – Telemont bagi Projek Teknologi Penanaman Cendawan Shiitake

Signing Ceremony of Cooperation between Nuclear Malaysia – Telemont on Shiitake Mushroom Cultivation Technology Project

13-14

Seminar Penggunaan Awam Teknologi Nuklear : UK – Malaysia Partners in Science, Bangi

Seminar On Civilian Nuclear : UK – Malaysia Partners in Science, Bangi

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Majlis Menandatangani Kerjasama Nuklear Malaysia – Mohsun Agri Sdn Bhd bagi Projek : Commercial Production of Anti-Oxidant Beta-Glucan from Oyster Mushroom Pleurotus sajor caju and Animal Feed from Spent Mushroom Substrates, Bangi

Signing Ceremony of Cooperation between Nuclear Malaysia – Mohsun Agri Sdn Bhd for : Commercial Production of Anti-Oxidant Beta-Glucan from Oyster Mushroom Pleurotus sajor caju and Animal Feed from Spent Mushroom Substrates, Bangi

16-18

Ekspo Teknologi Malaysia 2012, PWTC

Malaysian Technology Expo 2012 (MTE 2012) , PWTC

Mac/March

6

Kursus Keselamatan Sinaran dan Kesihatan Pekerja, Bangi

Course on Radiation Safety and Health for Workers, Bangi

8

Taklimat Penerbitan Ensiklopedia oleh Pegawai Bahagian Ensiklopedia Dewan Bahasa dan Pustaka, Bangi

Briefing on Encyclopedia Publication by Officers from Encyclopedia Section, Dewan Bahasa dan Pustaka, Bangi

12

Seminar Program Peningkatan Kompetensi Juruperunding Perlindungan Sinaran, Bangi

Seminar on Competency Enhancement Programme for Radiation Protection Consultant, Bangi

19

Lawatan Pegawai Institut Penyelidikan Perikanan Malaysia, Bangi

Visit by Officers from Fisheries Research Institute Malaysia, Bangi

20-21

Bengkel TSO Siri-4 : Pembangunan Penilaian Teknikal Bidaan Untuk Loji Kuasa Nuklear, Bangi

TSO Workshop on Development of Technical Bid Evaluation for Nuclear Power Plant, Series 4, Bangi

26-30

Seminar Perkongsian Pengalaman dalam Kuasa Nuklear oleh delegasi dari Jepun, Bangi

Seminar on Sharing of Experience on Nuclear Power by delegates from Japan, Bangi

31

Seminar Pengimejan Perubatan, Kota Bharu

Seminar on Medical Imaging, Kota Bharu

April / *April*

3

Majlis Anugerah Perkhidmatan Cemerlang 2011
Excellence Service Award 2011

4-7

Bengkel Audit Keselamatan Sinaran ISO/IEC 17024 , Bangi
Workshop on Radiation Safety Audit for ISO/IEC 17024, Bangi

12-13

Seminar Pengurusan Kualiti dan Inovasi (SPQI), Bangi
Seminar on Quality and Innovation Management, Bangi

16-20

Penyampaian cenderahati Bengkel IAEA/TC Kitaran Bahan Api Nuklear, Bangi

IAEA/TC Workshop on Nuclear Fuel Cycle, Bangi

23

Lawatan Dr S C Sood, Pakar IAEA ke Pusat Data Nuklear Malaysia

Visit by Dr S C Sood, IAEA Expert to Nuclear Malaysia Data Centre

23 - 27

Kursus Latihan Serantau Pemodelan Sumber Manusia Kuasa Nuklear (NPHR), Bangi

Regional Training Course on Nuclear Power Human Resources (NPHR) Modelling Tool, Bangi

24

Mesyuarat Agung PUSPANITA Nuklear Malaysia, Bangi

PUSPANITA General Meeting, Bangi

26

Kursus Kesedaran Keselamatan Radiologi Kepada Pekerja Sinaran, Bangi

Course on Radiological Safety Awareness for Radiation Workers, Bangi

29

Sambutan Hari 5S Nuklear Malaysia , Bangi

Nuclear Malaysia 5S Day, Bangi

Mei/May

7 - 11

Mesyuarat Perancangan Projek IAEA/RCA bagi Projek Baru Pencemaran Udara, Kuala Lumpur

IAEA/RCA Project Planning Meeting on New Project on Air Pollution (RAS2010019) , Kuala Lumpur

8

Majlis Perasmian Pameran Harta Intelek Nuklear Malaysia, Bangi

Nuclear Malaysia Intellectual Property(IP) Showcase Opening Ceremony, Bangi

17
Seminar Kuasa Nuklear, Bangi
Seminar on Nuclear Power, Bangi

22-26
Bengkel GMP On Manufacturing Of Tc-99m Generator, Cherating
Workshop GMP On Manufacturing Of Tc-99m Generator, Cherating

24 - 25
Perbincangan Pelan Strategik Penggunaan Reaktor TRIGA PUSPATI bersama Pakar IAEA, Dr Danas Ridikas, Bangi
Discussion on Strategic Plan on Utilization of Reaktor TRIGA PUSPATI with IAEA Expert Dr Danas Ridikas, Bangi

28
Program Bercerita Bersama Kanak-kanak Sempena Cuti Sekolah, Bangi
Story Telling Programme with Children During School Holiday, Bangi

28
Klinik ISO/IEC 17025 Siri 2/2012, Bangi
ISO/IEC 17025 Series 2/2012 Clinic, Bangi

28 Mei-1 Jun
Kursus Pengukuhan Prinsip Perkhidmatan , Melaka
Course on Strengthening Principles of Service, Melaka

Jun/ *June*

4

Seminar CTBT sempena Lawatan Geosains Australia, Bangi

CTBT Seminar in conjunction with visit by Geoscience Australia

4 - 8

Latihan Serantau IAEA bagi Teknik Radiografi Industri Digital bagi Personel Tahap 2, Bangi

IAEA Regional Training Course on Digital Industrial Radiography Technique for Personnel Already Certified in Level 2, Bangi

5 - 7

Persidangan dan Bengkel Perlindungan Sinaran (RPO) 2012 , Pulau Pinang

Conference and Workshop on Radiation Protection (RPO) 2012, Pulau Pinang

13

Lawatan delegasi UTM diketuai oleh Prof. Dato' Ir. Dr. Zaini Ujang, Naib Cancelor Universiti Teknologi Malaysia

Visit by UTM delegation headed by Prof. Dato' Ir. Dr. Zaini Ujang, Vice Chancellor Universiti Teknologi Malaysia

20

'Pesta Makan Buah' Nuklear Malaysia, Bangi

Nuclear Malaysia 'Fruits Festival', Bangi

26

Bengkel Pengurusan Pengetahuan Berorientasikan Proses (POKM), Bangi

Process Oriented Knowledge Management (POKM) Workshop, Bangi

26 -29

Bengkel Keselamatan dan Kesihatan Sinaran, Bangi

Workshop on Safety and Health, Bangi

28

Mesyuarat Agung Tahunan Koperasi PUSPATI, Bangi

Koperasi PUSPATI Annual General Meeting, Bangi

28

Mesyuarat Majlis Bersama Jabatan (MBJ) Nuklear Malaysia, Bangi

Nuclear Malaysia Majlis Bersama Jabatan (MBJ) Meeting, Bangi

Julai/ July

2 – 4

Hari Inovasi/Hari Terbuka Nuklear Malaysia 2012/Sambutan 40 Tahun Nuklear Malaysia Dan Sambutan 30 Tahun Reaktor TRIGA PUSPATI (RTP), Bangi

Nuclear Malaysia Innovation Day/ Open Day/40 years Nuclear Malaysia and 30 years Reaktor TRIGA PUSPATI (RTP), Bangi

3

Simposium Pengurusan Kualiti 2012 , Kuala Lumpur

Quality Management Symposium 2012, Kuala Lumpur foto dgn siti hajar latihan

6

Lawatan Staf dan Peserta Maktab Turus Angkatan Tentera Malaysia, Bangi

Visit by Staff and Participants from Malaysian Armed Forces Staff College, Bangi

9-20

Kursus Latihan Susulan Kejuruteraan Reaktor, Bangi

1st Follow –up Training Course (FTC) on Reactor Engineering, Bangi

17

Bengkel Penulisan Ensiklopedia Nuklear, Bangi

Workshop on Writing of Nuclear Encyclopedia, Bangi

17 -18

Seminar Keselamatan Makanan, Kuala Lumpur

Seminar on Food Safety, Kuala Lumpur

17 - 20

Bengkel Pembangunan Prosedur Kecemasan Agensi Nuklear Malaysia, Genting Highland

Workshop on Development of Nuclear Malaysia Safety Procedures, Genting Highland tunggu foto asmaliza

Ogos/*August*

10

Majlis Berbuka Puasa Nuklear Malaysia, Bangi

Iftar Ramadhan, Nuclear Malaysia, Bangi

14

Kursus Fermentasi Kultur Cendawan Tenggelam, Bangi

Course on Mushroom Submerged Culture Fermentation, Bangi

16

Majlis Penyampaian Hamper Raya Kepada Pasukan Keselamatan, Bangi

Raya Hamper Gift to Security Personnel, Bangi

22 - 24

Bengkel IAEA mengenai Pembangunan Repositori Sisa Radioaktif, Kuala Lumpur

IAEA Workshop on Development Of A Radioactive Waste Repository , Kuala Lumpur

28-30

Bengkel Kajian Kes Projek RMK10: Kajian Aplikasi Nuklear: Kebolehlaksanaan Pengeluaran Isotop Kegunaan Perubatan dan Industri Secara Komersil, Genting Highland

Workshop on Case Study on RMK10 Project : Nuclear Aplication Study :The Feasibility of Commercially Production of Medical Purpose Isotope, Genting Highland

September/*September*

6

Lawatan Teknikal delegasi KAERI ke RTP Nuklear Malaysia, Bangi

Technical Visit by KAERI delegation to RTP, Bangi

6

Perbincangan Dua Hala Integrated Support Centre for Nuclear Proliferation and Nuclear Security (ISCN), IAEA and Nuclear Malaysia, Bangi

Bilateral Discussion on Integrated Support Centre for Nuclear Proliferation and Nuclear Security (ISCN), IAEA and Nuclear Malaysia, Bangi

10

Bengkel Nanostruktur Terfungsi Untuk Peranti Sensor dan Tenaga, Bangi

Workshop on Functional Nanostructures for Energy and Sensor Devices, Bangi

12

Majlis menandatangani Perjanjian Persefahaman antara Nuklear Malaysia dan Persatuan Kanser Kebangsaan, Putrajaya

MoU signing ceremony between Nuclear Malaysia and National Cancer Society, Malaysia, Putrajaya

12

Seminar Kesedaran Kanser, Bangi

Seminar on Cancer Awareness, Bangi

13

Perhimpunan Pagi dan Sambutan Hari Raya, Bangi

Morning Assembly and Eid Celebration, Bangi

18

Kursus Pengajian Pascasiswazah Perlindungan Sinaran dan Keselamatan Punca Sinaran ke-9, Bangi

9th Post graduate Educational Course on Radiation Protection and The Safety of Radiation Sources (PGEC-9), Bangi

19-21

Kursus Asas Perisian Linux, Bangi

Basic Course on Linux Software, Bangi

24

Lawatan Kerja Ali Boussaha, Pengarah Bahagian Asia dan Pasifik, Jabatan Kerjasama Teknikal, IAEA

Working Visit by Mr Ali Boussaha, Director Division for Asia and the Pasific, Department of Technical Cooperation, IAEA

24

Lawatan Delegasi NDT dari Jordan

Visit by Jordanian NDT delegation

25 - 26
Persidangan Sinaran Tidak Mengion (NIR), Kuala Lumpur
Seminar on Non Ionising Radiation (NIR), Kuala Lumpur

26
Seminar R&D Nuklear Malaysia 2012, Bangi
Nuclear Malaysia R&D Seminar 2012, Bangi

Oktober / October

1
Kursus Asas Keselamatan Dan Kesihatan Penyelia Kawasan, Bangi
Basic Course on Safety and Health for Area Supervisor, Bangi

1 - 5
Latihan Susulan Pemonitoran Keradioaktifan Alam Sekitar dan Kesiapsiagaan Kecemasan Radiologi Nuklear, Bangi
1st Follow up Training Course (FTC) on Environmental Radioactivity Monitoring (ERM) and Nuclear Radiological Emergency Preparedness (NREP), Bangi

4
Bengkel TSO Siri 5: Bengkel Pembangunan Metodologi Penilaian Keselamatan Loji Kuasa Nuklear, Bangi
TSO Workshop Series 5 : Methodology Development for Nuclear Power Plant Safety Evaluation, Bangi

8
Bengkel GMP: Pengeluaran Generator Tc-99m, Bangi
GMP Workshop: Production of Tc-9m Generator, Bangi

9

Kursus Induksi Khusus Jabatan bagi Kumpulan Pengurusan Profesional dan Sokongan, Bil. 1, 2012, Bangi

Departmental Induction Course for Officers and Support Staff, Series 1, 2012, Bangi

10-13

Kursus Pembangunan Pasukan dan Perancangan Strategik Kumpulan Radiokimia dan Alam Sekitar, Port Dickson

Course on Team Development and Strategic Planning of Radiochemistry and Environment Group, Port Dickson

13

Bengkel Kaedah Penyelidikan Analisis Data Menggunakan Perisian SPSS, Bangi

Workshop on SPSS Application for Research Data Analysis, Bangi

16 - 19

Bengkel Kerjasama Teknikal bagi Penilaian dan Pemilihan Teknologi Kuasa Nuklear, Bangi

TC Workshop On Nuclear Power Technology Assessment And Selection, Bangi

17 - 23

Seminar Penilaian Teknologi Logi Kuasa Nuklear : Suatu Unsur Penting bagi Organisasi Sokongan Teknikal yang Kompeten, Bangi

Seminar on Technology Assessment of Nuclear Power Plant : An Important Element for a Competent Technical Support Organization (TSO), Bangi

17

Seminar Kitaran Semula Dross Aluminium, Bangi

Seminar on The Recycling of Aluminium Dross, Bangi

19

'Sukan Rakyat' Nuklear Malaysia, Bangi

Nuclear Malaysia 'Folks Games', Bangi

22

Bengkel Pemantapan Budaya Kualiti Makmal Standard Dosimetri Sekunder (SSDL), Cherating

Workshop on Consolidation of Quality Culture for SSDL, Cherating

30 - 31

Bengkel TSO Siri 6: Bengkel Penyediaan Laporan Awal Kajian Keselamatan, Bangi

TSO Workshop Series 6 : Preparation of Initial Safety Report, Bangi

30

Bengkel Penyediaan Dokumen Amalan Pengilangan Baik (GMP) Bagi Pengeluaran Kit Radiofarmaseutik dan Komponen Penjana Tc-99m, Bangi

Workshop on GMP Document Preparation for Production of Radiopharmaceutical Kit and Tc-99m Generator Components, Bangi

November

November / *November*

5

Lawatan delegasi Mongolia, Bangi

Visit by Mongolian delegation, Bangi

5 - 7

Konferen dan Pameran BioMalaysia 2012, Kuala Lumpur

BioMalaysia Conference and Exhibition 2012, Kuala Lumpur

7

Seminar Keutuhan dan Struktur Bahan, Kuala Lumpur

Seminar on Material and Structural Integrity, Kuala Lumpur

9

Misi Pakar IAEA bagi Pembangunan Polisi Pengurusan Sisa Radioaktif dan Bahan Api Nuklear Terpakai, Bangi

IAEA Expert Mission on Policy Development for Radioactive Waste and Spent Fuel Management, Bangi

12 - 16

Mesyuarat dan Bengkel Keselamatan Sinaran dan Pengurusan Sisa Radioaktif Forum for Nuclear Cooperation in Asia (FNCA) 2012, Kuala Lumpur

Forum for Nuclear Cooperation in Asia (FNCA) Radiation Safety & Radioactive Waste Management Meeting And Workshop 2012, Kuala Lumpur

26 - 30

Bengkel Pengetahuan Penting: Penilaian Laporan Analisa Keselamatan, Bangi

Workshop Essential Knowledge: Evaluation on Safety Analysis Report, Bangi

26

Bengkel Pembangunan Garis Panduan Pengurusan Projek bagi Program Kuasa Nuklear di Malaysia: Berdasarkan kepada Proses Pelesenan, Bangi

Workshop on Development of Guidelines for Nuclear Power Programme Project Management in Malaysia : Based on Licensing Process, Bangi

◀ **28 - 30**

Kursus Tatacara Kelakuan dan Tatatertib Dalam Perkhidmatan Awam, Ayer Keroh

Course on Guidelines on Conduct and Discipline in Civil Service, Ayer Keroh

◀ **28**

Program Galakan Membaca Sempena Cuti Sekolah, Bangi

School Holiday Reading Campaign Programme, Bangi

Disember/ *December*

3 - 6

Bengkel Serantau Asia Tenggara ke- 2 Keselamatan Punca Radioaktif Level B, Putrajaya

2nd South East Asia Regional Workshop on Radioactive Source Security Level B, Putrajaya

3

Bengkel Pemantapan GMP Kosmetik : Pengemaskinian Tatacara, Audit Dalaman dan Penarikan Semula Produk, Ayer Keroh

Workshop Updates on Guidelines, Internal Audit and Product Recall, Ayer Keroh

Kursus Latihan Kebangsaan Aplikasi Teknik Isotop dan Nukllear Termaju untuk Penambahbaikan Kualiti Tanah dan Produktiviti Tanaman, Bangi

National Training Course on the Application of Advanced Isotopic and Nuclear Techniques for the Improvement of Soil Quality and Crop Productivity, Bangi

Bengkel Kebangsaan Teknik Penjejakan Partikel Radioaktif untuk Penyiasatan Proses Hidrodinamik, Bangi

National Workshop on Radioactive Particle Tracking Techniques for Investigating Process Hydrodynamics, Bangi

17 - 20

Sesi Pengukuran Prestasi 2012 dan Sasaran Kerja Tahunan 2013, Bangi

2012 Performance Evaluation and 2013 Annual Operation Planning Session, Bangi

17

Lawatan Tapak Projek Technofund dan Sciencefund oleh KSU MOSTI, Bangi

Technofund and Sciencefund Project Site Visit by KSU MOSTI, Bangi

21

Malam Mengenang Budi Nuklear Malaysia, Bangi

Farewell Dinner for Retired Staff, Nuclear Malaysia , Bangi

8. Penyelidikan Dan Pembangunan Teknologi

8. Research And Technology Development

8.0 PENYELIDIKAN DAN PEMBANGUNAN TEKNOLOGI

Penyelidikan dan pembangunan (R&D) adalah asas dan inti pati kepada proses penyelidikan gunaan dan penghasilan. Sebagai peneraju R&D dalam pelbagai aspek teknologi nuklear dan yang berkaitan, Nuklear Malaysia terus memacu kecemerlangan di dalam R&D dengan menumpukan kepada enam bidang utama. Bidang tersebut ialah teknologi industri, teknologi pemprosesan sinaran, teknologi perubatan, agroteknologi dan biosains, keselamatan sinaran dan pengurusan sisa, di samping projek-projek yang dapat memenuhi kehendak pasaran.

8.1 Pencapaian R&D

Tahun 2012 adalah tahun pencapaian R&D yang memberangsangkan bagi Nuklear Malaysia baik di peringkat kebangsaan mahupun antarabangsa. Tahun ini juga merupakan tahun yang penuh dengan pelbagai kejayaan, penemuan dan pengiktirafan terhadap Nuklear Malaysia dalam usaha mengekalkan status sebagai salah sebuah institusi penyelidikan yang bertaraf dunia.

8.1.1 Output penyelidikan

Sejumlah 43 output penyelidikan yang merangkumi penghasilan produk, proses baru, prosedur baru, pangkalan data dan perisian telah berjaya dihasilkan seperti yang ditunjukkan dalam jadual 8.1

8.0 RESEARCH AND TECHNOLOGY DEVELOPMENT

Research and development (R&D) is the foundation and essence of applied research and production processes. Having spearheaded extensive research and development in various aspects of nuclear and related technologies. Nuclear Malaysia will continue to forge ahead in R&D with focusing on six priority areas, namely, industrial technology, radiation processing technology, medical technology and agrotechnology and biosciences, radiation safety and waste management as well as those projects that meet current market demands.

8.1 R&D Achievement

The year 2012 was marked by significant moments in R&D for Nuclear Malaysia at both international and national platforms. It has been a year of successes, discovery and recognition for Nuclear Malaysia in pursuit towards becoming a world-class research institution in nuclear technology.

8.1.1 Research Outputs

A total of 43 research outputs has been produced and developed. These various research outputs are categorized into development of products, new processes, new procedures, databases and software as shown in tables 8.1

Jenis Output	*Type of Output*	Bilangan / *Number*
Produk	*Product*	22
Proses	*Process*	4
Perisian	*Software*	5
Prosedur	*Procedure*	8
Pangkalan Data	*Database*	4

Jadual 8.1 Jumlah dan jenis output
Table 8.1 Number and type of output

Jadual 8.2 Senarai produk
Table 8.2 List of products

Bil / *No*	Produk / *Product*
1.	Pengimbas MT *MT scanner*
2.	Pengimbas paras MW *MW level scanner*
3.	Pelantar aliran tekanan rendah yang dilengkapkan dengan ECT *Low pressure flow rig equipped with ECT*
4.	Ujian pelantar – tekanan tinggi suhu tinggi diluluskan DOSH *DOSH approved High temperature high pressure (HTHP) test rig*
5.	Nano partikel TiO2 *TiO2 nanoparticles*
6.	Filem nipis nano TiO2 *Nano TiO2 thin films*
7.	Probe ultrasonik untuk pengukuran konkrit *Ultrasonic probe for concrete measurement*
8.	Sistem termografi aruhan arus pusar integrasi untuk mengesan dan menilai kecacatan paip dalam loji kuasa nuklear *Intergrated Eddy Current-induction thermography system for the detection and evaluation of pipeline imperfection in nuclear power plant*
9.	Cat pelbagai warna photocatalytic rutile boleh aktif cahaya nampak *Visible light activated photocatalytic rutile multicolor paint*
10.	Cat logam berdop-anatase pemusnah kulat dan gas berbahaya *Double metal-doped anatase paint for degradation of fungus, microbes and hazardous gases*
11.	*Sniper avant-garde* (sistem NDT laser mudah alih) *Sniper avant-garde (portable laser NDT system)*
12.	MWCNT difungsikan secara in-situ dengan sinaran gama *In-situ functionalized MWCNT by gamma irradiation*
13.	Sebatian EPDM termaju untuk kegunaan automotif *Advanced EPDM compounds for automotive application*
14.	Kitar semula sagu industri untuk pengeluaran air super penyerap (SWA) menggunakan teknologi sinaran *Recycling of sago industries waste for production of super water absorbent (SWA) using radiation technology*
15.	Kit pengesan minyak gaharu *Gaharu oil rapid detection*
16.	Minyak wangi Gaharu *Gaharu perfume*

Jadual 8.2 Senarai produk
Table 8.2 List of products

Bil / No	Produk / Product
17.	Mutan Kekwa *cream marble* *Chrysanthemun mutant-cream marble*
18.	Mutan Orkid - Dendrobium Sonia KeenaPearl *Orchid mutant– Dendrobium Sonia KeenaPearl*
19.	GITACHOC Delight – Ginseng Tongkat Ali perisa coklat *GITACHOC Delight – Ginseng Tongkat Ali enriched chocolate delights*
20.	BioGitaTea
21.	Gawa - papan partikel gaharu dari bahan sampingan gaharu *Gawa - gaharu particle boards from gaharu by-product*
22.	Acuan konkrit bertaut dan bongkah konkrit bertaut *Interlocked concrete moulds and interlocked concrete blocks*

Jadual 8.3 Senarai proses
Table 8.3 List of processes

Bil / No	Proses / Process
1.	Pembangunan MWCNT difungsikan secara in-situ dengan sinaran gama *Development of novel in-situ fuctionalised MWCNT by gamma irradiation*
2.	Penentusahan metodologi pengukuran keaktifan Sr-90 dalam sampel makanan dan alam sekitar menggunakan Sistem Pembilang Gros Beta *Method validation for measurement of Sr-90 activity in food and environment samples using Gross Beta Counting System*
3.	Penentusahan metodologi pengukuran keaktifan H-3 dalam sampel air menggunakan Sistem Pembilang Sintilasi Cecair *Method validation for measurement of H-3 activity in water using liquid scintillation Counting System*
4.	Pembangunan metodologi bagi penambahbaikan teknik yang sedia ada bagi pengukuran Po-210 dalam sampel alam sekitar dan industri menggunakan teknik pemisahan Radiokimia dan Sistem Spektrometri Alfa *Methodology development of upgrading existing technique for measurement of Po-210 in environment and industrial samples using radiochemistry separation technique and Alpha Spectrometry System*

Jadual 8.4 Senarai prosedur
Table 8.4 List of procedures

Bil / *No*	Prosedur / *Procedure*
1.	Prosedur arahan kerja bagi pengukuran keaktifan Sr-90 dalam sampel makanan dan alam sekitar menggunakan Sistem Pembilang Gros Beta *Working instruction procedure for Sr-90 activity measurement in food and environment using Gross Beta Counter System*
2.	Penggunaan elektrokimia untuk menganalisa dan menjangkakan kakisan galvanik *Use of electrochemical for analyzing and estimating galvanic corrosion*
3.	Penggunaan kaedah persempadanan dalam menganalisa dan menganggarkan kakisan galvanik *Use of Boundry Element method in analyzing and estimating galvanic corrosion*
4.	Pemantauan kelakuan aliran secara talian *Flow behavior online monitoring*
5.	Kaedah pengubahsuaian hidrotermal *Modified hydrothermal methods*
6.	Kaedah pengubahsuaian solgel *Modified solgel method*
7.	Kaedah menghasilkan cat pelbagai warna *photocatalytic rutile* yang boleh digunakan untuk pelbagai aplikasi *Method of producing photocatalytic rutile paint with multifunctional applications*
8.	Prosedur analisis kuantiti minyak Gaharu *Gaharu oil qualitative analysis procedure*

Jadual 8.5 Senarai perisian
Table 8.5 List of softwares

Bil / *No*	Perisian / *Software*
1.	Perisian analisa pengimbas MT 2.0 *MT Scanner analysis Software 2.0*
2.	Sistem kawalan MW 1.2 *MW control system 1.2*
3.	Sistem perolehan data SANS IgorPro *IgorPro SANS Data Acquisition System*
4.	Data analisis SANS myPerl *SANS data analysis myPerl*
5.	KFringe

Jadual 8.6 Senarai pangkalan data
Table 8.6 List of databases

Bil / *No*	**Pangkalan data** / *Database*
1.	Pangkalan data awalan taburan flora di Rumah Hijau Gama *Preliminary database on Flora Distribution at GGH*
2.	*Tradescantia pallida* sebagai biosensor berpotensi untuk dedahan sinaran dos rendah *Tradescantia pallida as a potential biosensor for exposure to low dose radiation*
3.	Korelasi ujian tanpa musnah (NDT) dengan ketumpatan konkrit; Data dan pengiraan taburan dos sinaran di sekitar dedahan rekabentuk *labyrinth* *Correlation of NDT with concrete density; Data and calculation on radiation dose distribution around labyrinth design exposure*
4.	Pangkalan data pengimbasan; "column scanning" *Database for scanning; "column scanning"*

8.1.2 Hasilan R&D berpotensi dikomersil

a) Sistem Termografi Arus Pusar

Sistem termografi arus pusar adalah sistem pengujian tanpa musnah (NDT) termaju (Foto 8.1). Teknik ini mengaruh arus pusar untuk memanaskan sampel kajian dan pengesanan kerosakan adalah berasaskan kepada perubahan arus pusar teraruh dari visual haba yang dirakam melalui kamera lampau merah. Melalui sistem ini, maklumat yang komprehensif mengenai integriti komponen kejuruteraan dan maklumat NDT konvensional boleh didapati.

8.1.2 R&D Findings with Commercial Potential

a) Eddy Current Thermography System

The eddy current thermography system is an advanced Non Destructive Testing (NDT) system (Photo 8.1). The technique uses induced eddy currents to heat the tested samples and defect detection is based on the changes of the induced eddy currents flows revealed by thermal visualisation captured by an infrared camera. Using the capabilities of the system and technique, complementing and comprehensive information about engineering components integrity in addition to more conventional NDT information can be obtained.

Foto 8.1 Sistem termografi arus pusar yang dibangunkan untuk mengesan kecacatan bahan
Photo 8.1 Eddy current thermography system developed to detect material defects

b) ULTRACLAWS SF0053

ULTRACLAWS SF0053 adalah sistem imbasan berasaskan ultrasonik yang menghasilkan imej 2D hirisan keratan rentas untuk penilaian resin gaharu dalam batang pokok karas. Sistem ini berkebolehan untuk menilai kuantiti gaharu yang dihasilkan melalui hirisan imej pokok (Foto 8.2).

b) ULTRACLAWS SF0053

ULTRACLAWS SF0053 is an ultrasonic-based scanning system that generates 2D cross section slice images for the evaluation of gaharu resin in karas trunk. It has the capability to evaluate the quantity of generated gaharu through the constructed slice images of the tree (Photo 8.2).

c) Bonigent: Sistem Penyampaian Drug ke Dalam Tisu Tulang Bonigent

Bonigent ialah hidroksiapatit (HA) poros yang disaluti dengan antibiotik gentamisin untuk sistem pelepasan *drug* (Foto 8.3). Gentamisin ini menyaluti HA poros dan diserap perlahan-lahan ke dalam tisu tulang selepas implantasi untuk meningkatkan keberkesanan *drug*, mengelakkan jangkitan sistemik, menghalang penghasilan biofilem, dan mempercepatkan proses penyembuhan. Biobahan HA ini adalah pengisi osteokonduktif yang dihasilkan di Nuklear Malaysia.

c) Drug Delivery System in Bone Tissue

Bonigent is a porous hydroxyapatite (HA) coated with gentamyacin antibiotic for drug delivery system (Photo 8.3). Gentamycin is coated on the porous HA scaffolds and released slowly into the bone tissue upon implantation to improve drug delivery, avoid systemic infection, prevent biofilm formation and accelerate healing process. The HA biomaterial is an osteoconductive filler produced locally at Nuclear Malaysia.

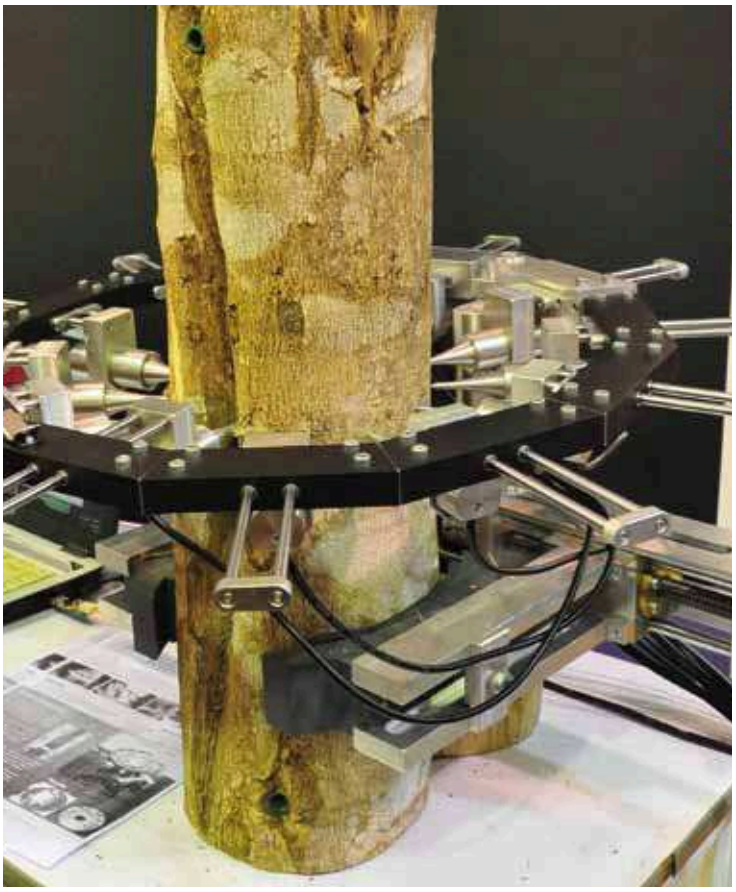


Foto 8.2 ULTRACLAWS SF0053 untuk pengesanan resin gaharu
Photo 8.2 ULTRACLAWS SF0053 for detection of gaharu resin

Foto 8.3 Bonigent yang disaluti dengan antibiotik gentamisin untuk sistem pelepasan drug ke dalam tisu tulang
Photo 8.3 Bonigent facilitates drug delivery coated with gentamyacin antibiotic for drug delivery system to bone tissues

d) Hidroksiapatit (HA) Sintetik dari Kulit Kerang

Serbuk HA yang dihasilkan dari kulit kerang telah dibangunkan sebagai bahan pengganti sintetik graf tulang untuk pembedahan ortopedik, kraniofasial, pergigian dan maksilofasial. Produk ini berpotensi menjadi bahan alternatif kepada kaedah penggantian graf tulang menggunakan autograf (bahan dari pesakit sama) dan alograf (bahan dari penderma) (Foto 8.4).

d) Synthetic Hydroxyapatite (HA) from Cockle Shell

HA powder from cockle shell was developed as a new synthetic bone graft substitute for orthopedic, craniofacial, dental and maxillofacial surgeries. This product has the potential to be an alternative material to bone graft substitute using autograft (material from same patient) and allograft (materials from donor) procedures (Photo 8.4).

Foto 8.4 Serbuk HA (kiri) daripada kulit kerang (kanan) untuk pengganti graf tulang
Photo 8.4 HA powder (left) from cockle shell (right) for bone graft substitute

e) Kit Pengesan Segera Ketulenan Minyak Gaharu

Kit pengesan segera minyak gaharu menyediakan kaedah cepat dan mudah-alih untuk mengesan ketulenan minyak gaharu (Foto 8.5). Prinsip kaedah ini adalah berasaskan kepada tindak balas kimia antara reagen pengesan dan minyak gaharu yang menghasilkan perubahan warna. Ia mudah digunakan dan sesuai untuk pengujian di lapangan.

e) Gaharu Oil Rapid Purity Detection Kit

Gaharu oil detection kit is a rapid and portable method for detecting the purity of the gaharu oil (Photo 8.5). The principle is based on the chemical reaction between the detecting reagent and the gaharu oil that results in colour changes. The kit is suitable for field testing.

Foto 8.5 Kit pengesan minyak gaharu untuk menilai ketulenan minyak gaharu
Photo 8.5 Gaharu oil detection kit for analyzing the purity of gaharu oil

f) "Gitachoc Delights" Coklat Baru Mengandungi Ekstrak Tongkat Ali dan Ginseng

Gitachoc Delights (Foto 8.6 a dan b) adalah coklat yang bertindak sebagai penambah tenaga dan meningkatkan pengaliran darah melalui penambahan kombinasi ekstrak Tongkat Ali dan Ginseng yang dihasilkan daripada akar yang dikulturkan dalam sistem bioreaktor. Produk ini adalah hasilan daripada projek CRDF MTDC bertajuk - *Commercialization of bioreactor for mass production of cell cultures of Eurycoma longifolia Jack (Tongkat Ali)*.

f) "Gitachoc Delights" New Chocolate Containing Tongkat Ali and Ginseng Extracts

Gitachoc Delights (Photo 8.6 a and b) is an energy chocolate confectionery that acts as energy booster and blood circulation enhancer with the combination of Tongkat Ali and Ginseng extracts from mass propagated roots derived from bioreactor technology. This product is one of the outputs of project CRDF MTDC entitled - Commercialization of bioreactor for mass production of cell cultures of Eurycoma longifolia Jack (Tongkat Ali).

Foto 8.6a Sistem bioreaktor (kanan) untuk penghasilan ekstrak Tongkat Ali dan Ginseng (kiri)
Photo 8.6a Bioreactor system (right) for the production of Tongkat Ali and Ginseng extracts (left)

Foto 8.6b Coklat 'Gitachoc Delights' dengan campuran ekstrak Tongkat Ali dan Ginseng
Photo 8.6b Gitachoc Delights chocolate mixed with Tongkat Ali and Ginseng extracts

g) "BioGitaTea" Teh Baru Mengandungi Tongkat Ali dan Ginseng

"BioGitaTea" adalah minuman teh yang dicampurkan dengan kombinasi ekstrak Tongkat Ali dan Ginseng daripada akar yang dipropagasi melalui teknologi bioreaktor (Foto 8.7a dan 8.7b) dan juga bertindak sebagai penambah tenaga dan meningkatkan peredaran darah.

g) "BioGitaTea" New Tea Containing Tongkat Ali and Ginseng

"BioGitaTea" is supplemented with combination of Tongkat Ali and Ginseng extracts from mass propagated roots derived from bioreactor technology (Photo 8.7a and 8.7b) that will act as energy booster and blood circulation enhancer.

Akar Tongkat Ali dan Ginseng
Tongkat Ali and Ginseng roots

Pengkulturan tisu Tongkat Ali di dalam biorektor berskala makmal
Tongkat Ali cell culture in lab scale bioreactor

Foto 8.7a Teknologi bioreaktor untuk penghasilan ekstrak Tongkat Ali dan Ginseng
Photo 8.7a Bioreactor technology for the production of Tongkat Ali and Ginseng extracts

Foto 8.7b Teh BioGitaTea yang dicampurkan dengan Tongkat Ali dan Ginseng dari teknologi bioreaktor
Photo 8.7b BioGitaTea mixed with Tongkat Ali and Ginseng extract from bioreactor technology

h) Varieti Mutan Baru Orkid Dendrobium "SoniaKeenaPearl"

Dendrobium Sonia 'KeenaPearl' (Foto 8.8) adalah varieti baru mutan yang dihasilkan melalui teknologi mutagenesis Dendrobium Sonia dengan sinaran gama pada dos 35 Gy dari sumber Kobalt-60. Varieti ini juga digunakan dalam kajian pengkomersilan dengan kerjasama syarikat Hexagon Green Sdn Bhd. yang dibiayai oleh MOSTI dan MOA. Mutan ini berpotensi untuk dikomersilkan berdasarkan sifat unik bunganya serta membantu dalam pembangunan industri florikultur di Malaysia.

h) New Commercial Mutant Orchid Varieties Dendrobium "SoniaKeenaPearl"

Dendrobium Sonia 'KeenaPearl' (Photo 8) is a new mutant variety generated through mutagenesis of Dendrobium Sonia using gamma rays at 35 Gy from the Cobalt-60 source. This new variety is currently undergoing a commercialization study with Hexagon Green Sdn. Bhd. and supported by a Technofund project by MOSTI and MOA. It has the potential to be ommmercialised due to its unique flower features and contributes to the development of the floriculture industry in Malaysia.

Foto 8.8 Induk orkid (kiri) dan mutan baru orkid yang dihasilkan (kanan)
Photo 8.8 Orchid mother plant (left) and new orchid mutant developed (right)

i) Tiub Nano Karbon Berbilang Dinding (MWCNT) yang Difungsikan Secara In-Situ dengan Sinaran Gama

Penemuan ini melibatkan teknik novel dan mudah dalam menghasilkan tiub nano karbon berbilang dinding (MWCNT) yang difungsikan secara in-situ melalui penyinaran gama (Foto 8.9a). Produk ini adalah selamat, tidak memerlukan pemanasan, boleh dihasilkan dalam waktu yang singkat, bebas cemaran dan mesra alam. MWCNT boleh digunakan dalam bidang industri, farmasiutikal dan perubatan. (Foto 8.9b)

i) In Situ Functionalised Multi-Walled Carbon Nanotube (MWCNT) by Gamma Radiation

The invention involves the novel and simple technique in producing in-situ functionalized multi-walled carbon nanotubes (MWCNT) by employing gamma irradiation (Photo 8.9a). This product is safe, requires no heating, needs lesser time to produce, free from contaminants and eco-friendly. MWCNT is suitable for application in industrial, pharmaceutical and medical fields. (Foto 8.9b)

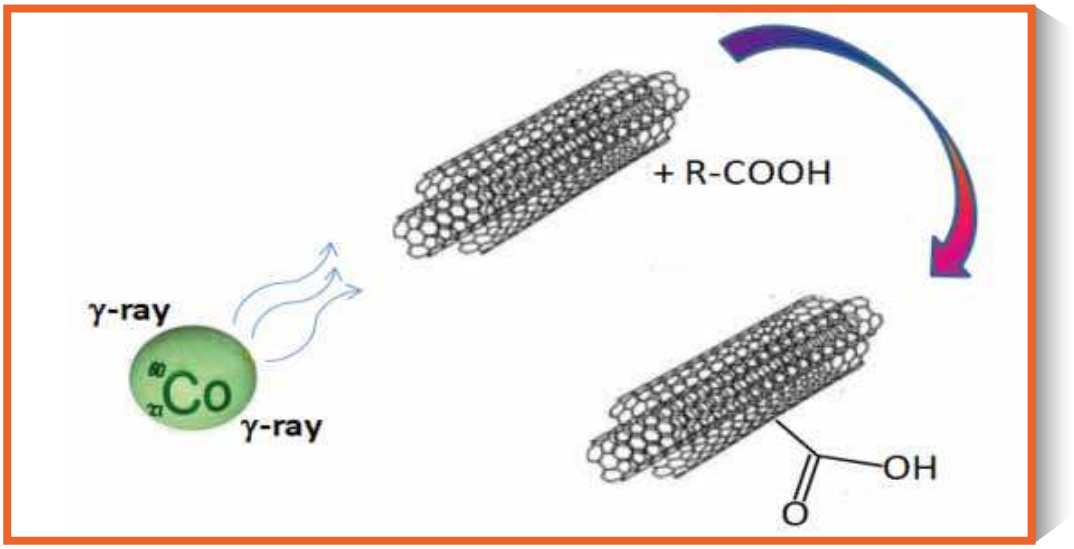


Foto 8.9a MWCNT yang difungsikan secara in-situ dengan sinaran gamma
Photo 8.9b MWCNT by gamma radiation

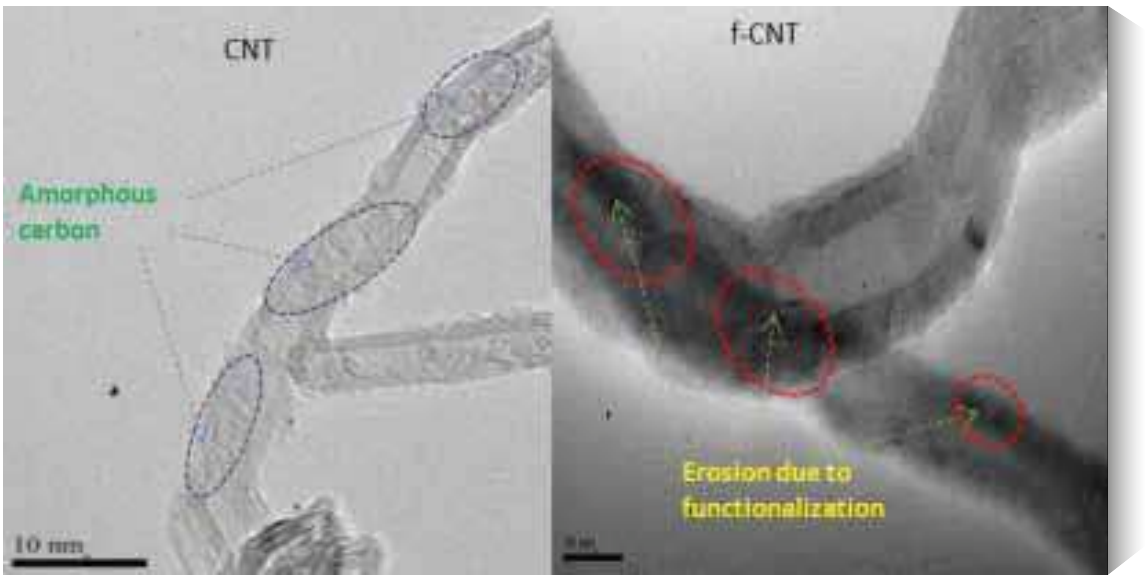


Foto 8.9b Mikrograf Mikroskop Elektron Transmisi (TEM) MWCNT
Photo 8.9b Transmission Electron Microscope (TEM) micrograph of MWCNT

j) *Super Water Absorbent (SWA)*

Bahan *Super Water Absorbent* (SWA) mesra alam telah dibangunkan dari buangan polimer semulajadi (sisa sagu) melalui teknologi pemprosesan sinaran (Foto 8.10). SWA mempunyai potensi sebagai penyimpan air tanah di kawasan pertanian yang kekurangan air atau semasa musim kemarau.

j) Super Water Absorbent (SWA)

Biodegradable Super Water Absorbent (SWA) material was developed from natural polymer waste (sago waste) by radiation processing (Photo 8.10). SWA has a potential to be used as soil water retainer in the area with limited access of water or during drought season for agriculture application.

Foto 8.10 Hampas sagu (atas) yang digunakan untuk penghasilan SWA (bawah)
Photo 8.10 Sago waste (top) used for the production of SWA (bottom)

k) Sebatian Termaju EPDM untuk Aplikasi Automatif

Termoplastik elastomer berasaskan getah *etilena-propilena-diena-terpolimer*(EPDM) dan polivinil klorida (PVC) yang diubahsuai dengan teknik penyinaran telah dibangunkan (Foto 8.11). Sebatian ini boleh digunakan untuk menghasilkan bahagian dalaman / luaran automotif yang fleksibel seperti jaluran cuaca dan profil penutup tingkap.

k) Advanced EPDM Compounds for Automotive Application

Thermoplastic elastomers based on ethylene-propylene-diene-terpolymer rubber (EPDM) and polyvinyl chloride (PVC) modified by a radiation technique were produced (Photo 8.11). The compounds can be used to produce flexible automotive interior/exterior parts such as weather strips and window sealing profiles

Foto 8.11 Jaluran cuaca daripada adunan getah etilena-propilena-diena-terpolimer (EPDM) dan polivinil klorida (PVC)
Photo 8.11 Weather strips from ethylene-propylene-diene-terpolymer rubber (EPDM) and polyvinyl chloride (PVC) blends

8.1.3 Penerbitan

Sejumlah 431 penerbitan telah berjaya dihasilkan seperti tersenarai dalam Jadual 8.7.

8.1.3 Publication

A total of 431 publications were produced as listed in Table 8.7.

Jadual 8.7 Jumlah penerbitan tahun 2012
Table 8.7 Number of publications in 2012

Penerbitan	*Publication*	Bilangan / *Number*
Buku	*Book*	1
Bab Dalam Buku	*Chapter in Book*	3
Tesis (Sarjana & PhD)	*Thesis – Masters & PhD*	13
Jurnal Antarabangsa	*International Journal*	62
Jurnal Kebangsaan	*National Journal*	33
Konferens Antarabangsa	*International Conference*	87
Konferens Kebangsaan	*National Conference*	107
Penerbitan Umum	*International General Publication*	7
Penerbitan Umum	*National General Publication*	24
Laporan Teknikal	*Technical Report*	94
Jumlah penerbitan	***Total publication***	**431**

8.1.4 Pengurusan Harta Intelek

Pada tahun 2012, Nuklear Malaysia telah memfailkan sebanyak empat paten baru yang ditunjukkan dalam Jadual 8.8.

8.1.4 Intellectual Property Management

In 2012, Nuclear Malaysia has filed four new patents as indicated in Table 8.8.

Jadual 8.8 Senarai paten yang difailkan
Table 8.8 List of patents filed

Bil *No*	Tajuk *Title*	No paten *Patent N*	Tarikh difail *Date filed*
1	*Method of producing high purity gamma and alpha alumina*	PI2012003429	30 / 7 / 2012
2	*Method of producing photocatalytic rutile titanium dioxide*	PI2012003514	3 / 8 /2012
3	*Composition of an armour unit and method of fabricating thereof*	PI2012004637	17 /10/2012
4	*An armour unit, a system and method of contructing thereof*	PI2012004638	17 /10/2012

8.2 Inovasi

8.2.1 Pencapaian Kebangsaan dan Antarabangsa – Inovasi

Sepanjang tahun 2012, Nuklear Malaysia telah menyertai beberapa pertandingan inovasi di peringkat kebangsaan mahupun antarabangsa. Antara pertandingan yang telah disertai di peringkat kebangsaan adalah Ekspo Inovasi Islam (i-Inova12), Pameran Rekacipta, Penyelidikan dan Inovasi (PRPI) UPM, BioMalaysia 2012 dan Malaysia Technology Expo 2012 (MTE 2012). Pencapaian Nuklear Malaysia dalam pertandingan inovasi adalah seperti yang ditunjukkan dalam Jadual 8.9

8.2 Inovasi

8.2.1 National and International Achievement – Innovation

Throughout 2012, Nuclear Malaysia participated in various innovation events held nationally and internationally such as Islamic Innovation Expo (i-Inova12), BioMalaysia 2012 and Malaysia Technology Expo 2012 (MTE 2012). Nuclear Malaysia's achievements in these events are shown in Table 8.9

Jadual 8.9 : Pencapaian inovasi Nuklear Malaysia
Table 8.9 : Nuclear Malaysia's innovation achievement

(a) Malaysia Technology Expo 2012 (MTE 2012), 16- 18 Feb 2012

Bil / *No.*	Anugerah / *Award*	Tajuk Projek / *Project Title*	Ketua Projek / *Project Leader*
1	Emas / *Gold*	*Radiatracer Injector – An Industrial Application (RIIA)*	Noraishah Othman
2	Emas / *Gold*	*Radicross Recycle Rubber for Diverse Sealing Applications*	Dr. Chantara Thevy Ratnam
3	Perak / *Silver*	*Manipulation of Radiation and Wastewater for Greener Environment*	Khomsaton Abu Bakar
4	Perak / *Silver*	*Method for Producing Active Mushroom Seed using Nuclear Technology*	Rosnani Abdul Rashid
5	Perak / *Silver*	*Synthesis of Polyethylene Glycol Diacrylate Nanogel Using Irradiation of Inverse Micelles Technique*	Mohd Yusof Hamzah
6	Perak / *Silver*	*Industrial Radiography Safety Kit (RT Safe 053)*	Mohd Noorul Ikhsan Mohamed@Ahmad
7	Perak / *Silver*	*Development of internally Crosslink Structure of Acrylated Palm Oil Micro and Nano particles as Drug Carrier in Delivery System)*	Rida Anak Tajau
8	Perak / *Silver*	*RIVERprotec: River Scouring Protection System*	Mohd Faizal Abd Rahman
9	Gangsa / *Bronze*	*Thermal Insulation Paint from Schedule Waste*	Dr. Meor Yusoff Meor Sulaiman
10	Gangsa / *Bronze*	*Knowledge Based Helpdesk System*	Mohamad Safuan Sulaiman

(b) BioMalaysia 2012 , 5- 7 Nov 2012

Bil / *No.*	Anugerah / *Award*	Tajuk Projek / *Project Title*	Ketua Projek/ *Project Leader*
1	Emas / *Gold*	*Biomass Derived Fuel Fire Starter(Bdf-Fire Starter)*	Mohamad Azman b. Che Mat Isa
2	Perak / *Silver*	*Development Of New Orchid Variety Through Nuclear Technology Dendrobium 'Sonia Keenapearl'*	Sakinah bt. Ariffin
3	Perak / *Silver*	*Development Of Soil-Efb Mixtures As Low Cost Filled Barrier Material For Waste Disposal Site*	Dr. Kamarudin Samuding

(c) Ekspo Inovasi Islam i-Inova 2012 USIM , 20 -21 Okt 2012

Bil / *No.*	Anugerah / *Award*	Tajuk Projek / *Project Title*	Ketua Projek / *Project Leader*
1	Anugerah Ibnu Sina	*Ultraclaw Sf0053-Ultrasonic Tomography Scanning System For Aqualaria Evaluation*	Mohd Noorul Ikhsan Mohamed@Ahmad
2	Anugerah Al-Khawarizmi	*RIVERprotec: Riverbank Scouring Protection System*	Mohd Faizal Abd Rahman
3	Anugerah Khas Malaysian Invention And Design Society (MINDS)	*Gitachoc Delights Ginseng Tongkat Ali Enriched Chocolate Delights*	Dr. Sobri Hussein
4	Emas *Gold*	*RIVERprotec: Riverbank Scouring Protection System*	Mohd Faizal Abd Rahman
5	Emas *Gold*	*Pomispot Welder*	Mohd Rizal Md Chulan
6	Emas *Gold*	*Ultraclaw Sf0053-Ultrasonic Tomography Scanning System For Aqualaria Evaluation*	Mohd Noorul Ikhsan Mohamed@Ahmad
7	Emas *Gold*	*A Bone Graft Substtutes (Synthetic Hydroxyapatite Porous Coated Gentamycin-Bonigent) As Drug Delivery System*	Rusnah Mustaffa
8	Emas *Gold*	*Functional Multiwalled Carbon Nanotubes As Nano-Asorbent For Industrial Water Treatment*	Mohd Hamzah Harun
9	Emas *Gold*	*Development Of Synthetic Hyroxyapatite From Cockle Shell As Potential Biomaterial For Use In Bone Repair*	Rusnah Mustaffa
10	Emas *Gold*	*Gitachoc Delights Ginseng Tongkat Ali Enriched Chocolate Delights*	Dr. Sobri Hussein

(c) Ekspo Inovasi Islam i-Inova 2012 USIM , 20 -21 Okt 2012

Bil / *No.*	Anugerah / *Award*	Tajuk Projek / *Project Title*	Ketua Projek / *Project Leader*
11	Perak *Silver*	*Biogita Tea An Energy Drink Supplemented With Tongkat Ali An Ginseng Extracts From Mass Propagated Roots Derived From Bioreactor Technology*	Dr. Sobri Hussein
12	Perak *Silver*	*Sniper Avantgarde Laser Ndt System For Stress Mapping*	Mohd Yusnisyam Yusof
13	Perak *Silver*	*Rocking Kiln-Fluidized Bed Reactor For Production Of Biomass Derived Fuel (Bdf); Green Fuel*	Mohd Azman Che Mat Isa
14	Gangsa *Bronze*	*Rt Safe 053 Mechanical Stand For Industrial Radiographhy*	Mohd Noorul Ikhsan Mohamed@Ahmad
15	Gangsa *Bronze*	*Smart Winder Automatic Gamma Winding System*	Mohd Noorul Ikhsan Mohamed@Ahmad

(d) Pameran Rekacipta, Penyelidikan dan Inovasi (PRPI) UPM, 17 -19 Jul 2012

Bil / *No.*	Anugerah / *Award*	Tajuk Projek / *Project Title*	Ketua Projek / *Project Leader*
1	Emas *Gold*	*Rt Safe 053 Mechanical Stand For Industrial Radiographhy*	Mohd Noorul Ikhsan Mohamed@Ahmad
2	Emas *Gold*	*Ultraclaw Sf0053-Ultrasonic Tomography Scanning System For Aquilaria Evaluation*	Mohd Noorul Ikhsan Mohamed@Ahmad

Selain itu, Nuklear Malaysia sekali lagi telah menganjurkan sambutan Hari Inovasi pada 2 hingga 4 Julai 2012. Program yang merupakan acara tahunan ini diadakan bagi mengetengahkan penemuan-penemuan baru dalam rekacipta inovasi dan hasil penyelidikan warga Nuklear Malaysia kepada komuniti penyelidik dan orang awam.

In addition, Nuclear Malaysia has also organized Innovation Day which was held on 2nd to 4th July, 2012. This annual event highlighted new discoveries in innovation and research by Nuclear Malaysia's researchers to the research communities and general public.

8.3 Pengurusan Kualiti

Bagi pengurusan kualiti pula, Nuklear Malaysia berjaya mengekalkan tujuh proses di bawah persijilan MS ISO 9001:2008, dua akreditasi makmal dengan MS ISO/IEC 17025, dua proses telah memperolehi persijilan Good Manufacturing Practice (GMP), satu proses memperolehi persijilan MS ISO 13485:2003 dan satu proses memperolehi Akreditasi MS ISO/IEC 17020. Dalam tahun 2012, satu persijilan Good Manufacturing Practice (GMP) untuk 'Manufacturing of Hydrogel Eye Fresh' dan satu persijilan MS ISO/IEC 17020 untuk Ujian Radiografi (RT)- Patri, Ujian Ultrasonik (UT) – Patri dan Penentuan Ketebalan serta Ujian Penembusan Cecair (PT) telah diperolehi. Senarai kemudahan yang mendapat persijilan ditunjukkan dalam Jadual 8.10.

8.3 Quality Management

With regards to quality management, Nuclear Malaysia has succesfully maintained seven processes with the MS ISO 9001:2008 certification, two accredited laboratories for MS ISO / IEC 17025, two processes for Good Manufacturing Practice (GMP), one process for MS ISO 13485: 2003 certification and one process for MS ISO/IEC 17020 accreditation. In 2012, one certification of Good Manufacturing Practice (GMP) for 'Manufacturing of Hydrogel Eye Fresh' and one certification of MS ISO/IEC 17020 Accreditation for Radiography Testing (RT)-Welding, Ultrasonic Testing (UT)-Welding and Thickness Measurement as well as Liquid Penetrant Testing (PT) were obtained. List of facilities certified are shown in Table 8.10.

Jadual 8.10: Senarai makmal dan proses yang disijilkan dengan Sistem Kualiti dan Piawaian Antarabangsa
Table 8.10: List of laboratories and processes certified with Quality System and International Standards

(a) Persijilan MS ISO 9001:2008 / *MS ISO 9001:2008 Certification*

1	Mintec-Sinagama 'Gamma Irradiation Service Using Co-60 Source For Medical Product, Consumer Product And Pharmaceuticals' (Tarikh Mula Persijilan 31 Mac 1991) – *Certification Date 31 March 1991*
2	Makmal Standard Dosimetri Sekunder (SSDL) – Secondary Standard Dosimetry Laboratory (SSDL) 'Provision Of Personnel Dosimetry Services Covering Supply Of Badges And Evaluation Of Dosimeters' (Tarikh Mula Persijilan 25 Jan. 2002) – *Certification Date 25 Jan 2002*
3	Bahagian Teknologi Industri (BTI) – Industrial Technology Division 'Provision Of Ultrasonic, Radiography, Pipescan And Column Scan Testing Services' (Tarikh Mula Persijilan 13 Sept. 2002) - *Certification Date 13 Sept 2002*
4	Unit Khidmat Latihan (UKL) - 'Administration Of Training Programs And Management Of Seminar/Conferences' (Tarikh Mula Persijilan 7 Mei 2002) - *Certification Date 7 May 2002*
5	Raymintex 'Production Of Prevulcanised Natural Rubber Latex By Using Gamma Radiation' (Tarikh Mula Persijilan 4 Nov 2003) - *Certification Date 4 Nov 2003*
6	Alurtron 'Provision Of Electron Beam Irradiation Services For Commercial Products' (Tarikh Mula Persijilan 7 Julai 2003) - *Certification Date 7 July 2003*
7	Pusat Pembangunan Teknologi Sisa– Waste Technology Development Centre (WasTeC) 'Management Of Radioactive Waste And Storage Of Radioactive Material' (Tarikh Mula Persijilan 11 Jun 2004) - *Certification Date 11 June 2004*

(b) Akreditasi MS ISO/IEC 17025 / *MS ISO/IEC 17025 Accreditation*

1	Makmal Radiokimia Dan Alam Sekitar (MAKMAL RAS) – *Radiochemistry and Environmental Laboratory* 'Field of Testing: Radioactivity' (Tarikh Mula Persijilan 8 Dis. 2005) - *Certification Date 8 Dec 2005*
2	Makmal Kalibrasi, SSDL – *Calibration Laboratory, SSDL* ' Radiation Dosimetry' (Tarikh Mula Persijilan 23 Julai 2004) – *Certification Date 23 July 2004*

(c) Persijilan Amalan Pengilangan Baik (GMP) / *Good Manufacturing Practice (GMP) Certification*

1	Bahagian Teknologi Perubatan (BTP) – *Medical Technology Division* 'Sterile Radiopharmaceutical' (Tarikh Mula Persijilan 11 Jun 2007) - *Certification Date 11 June 2007*
2	Bahagian Agroteknologi dan Biosains (BAB) – *Agrotechnology and Bioscience Division* 'Manufacturing of Hydrogel Eye Fresh ' (Tarikh Mula Persijilan 29 Mac 2012) - *Certification Date 29 Mac 2012*

(d) Persijilan MS ISO 13485:2003 / *MS ISO 13485:2003 Certification*

1	Mintec-Sinagama 'Provision of Gamma Irradiation Processing Services to Customer Specified Requirements, including EN 552 and ISO 11137' (Tarikh Mula Persijilan 27 September 1999) - *Certification Date 27 Sept 1999*

(e) Akreditasi MS ISO/IEC 17020 / *MS ISO/IEC 17020 Accreditation*

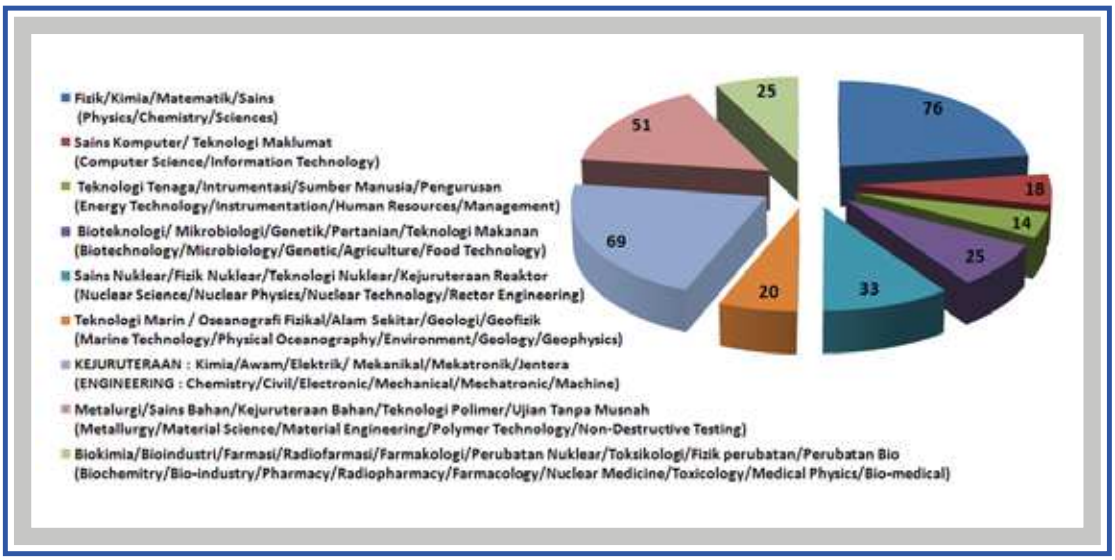
1	Bahagian Teknologi Industri (BTI) – *Industrial Technology Division* *Radiography Testing (RT)-Welding* *Ultrasonic Testing (UT)-Welding and Thickness Measurement* *Liquid Penetrant Testing (PT)- Welding and Engineering Components* (Tarikh Mula Persijilan 25 April 2012) - *Certification Date 25 April 2012*

8.4 Bidang Kepakaran

Nuklear Malaysia mempunyai seramai 331 penyelidik dalam pelbagai bidang kepakaran sains, kejuruteraan dan teknologi berkaitan nuklear seperti Rajah 8.1

8.4 Field of Expertise

Nuclear Malaysia has 331 researchers in various field of expertise including sciences, engineering and nuclear related technologies as shown in Figure 8.1



Rajah 8.1 Bidang kepakaran pegawai penyelidik Nuklear Malaysia
Figure 8.1 Fields of expertise of research officers in Nuclear Malaysia

8.5 Dana Penyelidikan

Geran pembiayaan dalaman, pembiayaan di peringkat kebangsaan dan antarabangsa yang dianugerahkan kepada penyelidik adalah penanda utama aktiviti penyelidikan. Dalam tahun 2012, Nuklear Malaysia telah menerima sejumlah RM 9.6 juta peruntukkan penyelidikan PQRD dan *Science Fund.*

8.5.1 Dana Kerajaan

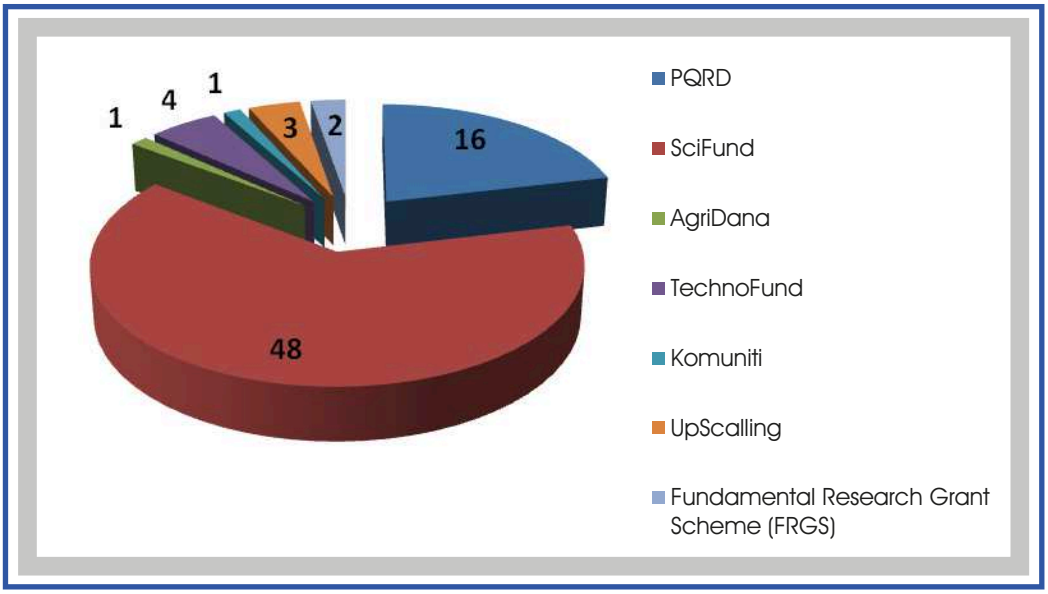
Rajah 2 menunjukkan geran penyelidikan kebangsaan yang dianugerahkan kepada Nuklear Malaysia seperti PQRD, SciFund, AgriDana(MOA), TechnoFund (MOSTI), Community Fund (MOSTI), Pra-pengkomersilan dan FRGS (MOHE).

8.5 Research Funding

Internal, national and international grants awarded to researchers are important key indicators of R&D activities. In 2012, Nuclear Malaysia has received RM 9.6 million in total PQRD and Science Fund research funding.

8.5.1 Government Funds

Figure 2 shows national research grants awarded to the researchers including Pre-Qualification of Research and Development (PQRD) grant as an internal grant, SciFund (MOSTI), AgriDana (MOA), TechnoFund (MOSTI), Community Fund (MOSTI), Pre-Commerciallization Fund (MOSTI) and Fundamental Research Grant System (FRGS)-(MOHE).



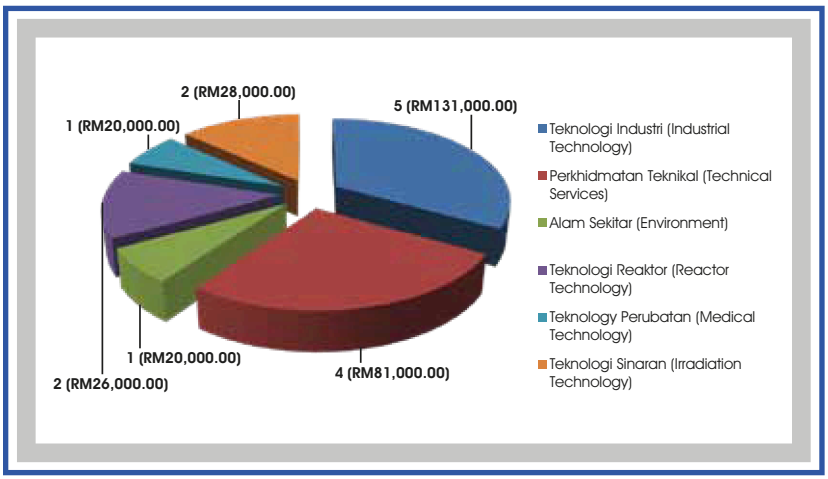
Rajah 8.2 Jumlah dana kerajaan (RM) mengikut kategori
Figure 8.2 Total government fund (RM) according to categories

(a) Dana PQRD

Geran dalaman (Pre-Qualification of R&D-PQRD) berfungsi untuk memulakan kajian awal projek penyelidikan baru. Bidang penyelidikan yang berjaya mendapat geran ini termasuk bidang industri, teknologi reaktor, alam sekitar, perubatan, pemprosesan sinaran adalah seperti ditunjukkan dalam Rajah 8.3. Sejumlah RM316,000.00 telah dikeluarkan untuk tujuan ini.

(a) PQRD Funds

Pre-Qualification of R&D or PQRD fund is internal grant for preliminary research work (seed fund). The field of research managed to acquire this grant including industrial, reactor technology, environment, medical and radiation processing are shown in Figure 8.3. A total RM316,000.00 was granted for this purpose.



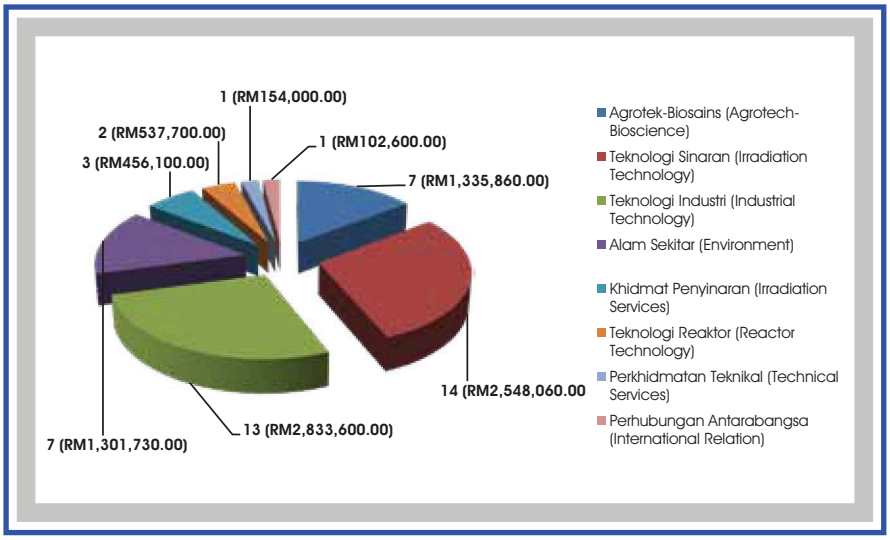
Rajah 8.3 Bilangan dana PQRD yang diluluskan untuk enam bidang utama kajian
Figure 8.3 Number of PQRD funds granted for research in six major areas.

(b) *ScienceFund*

Aktiviti di bawah *ScienceFund* melibatkan penyelidikan penggunaan teknologi nuklear di dalam industri, agro-biosains, alam sekitar dan pemprosesan sinaran seperti ditunjukkan dalam Rajah 8.4. Sejumlah RM9,269,650.00 telah berjaya diperoleh.

(b) ScienceFund

Research and developments funded by ScienceFund is mainly in nuclear application in industries, agro-biosciences, environment and radiation processing as shown in Figure 8.4. A total RM9,269,650.00 has been awarded.



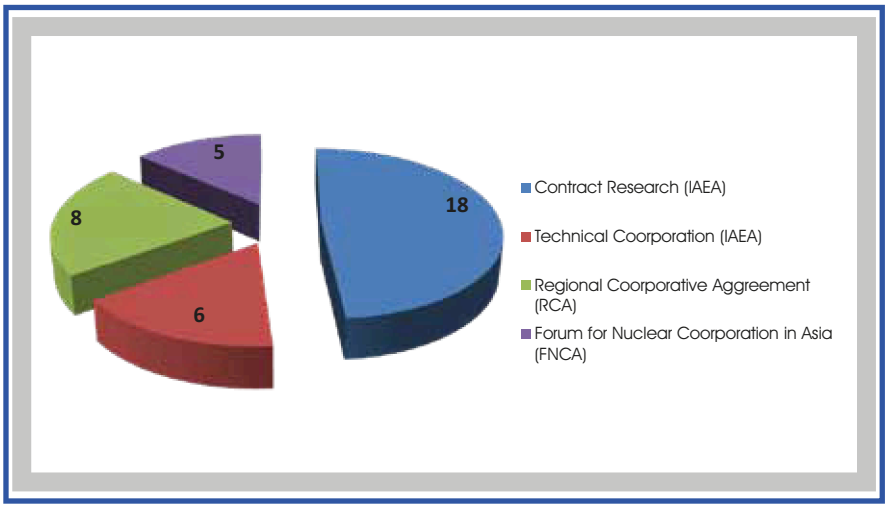
Rajah 8.4 Bilangan bidang penyelidikan yang dibiayai oleh Dana Sains
Figure 8.4 Numbers of research areas supported by ScienceFund grants

8.5.2 Dana Antarabangsa

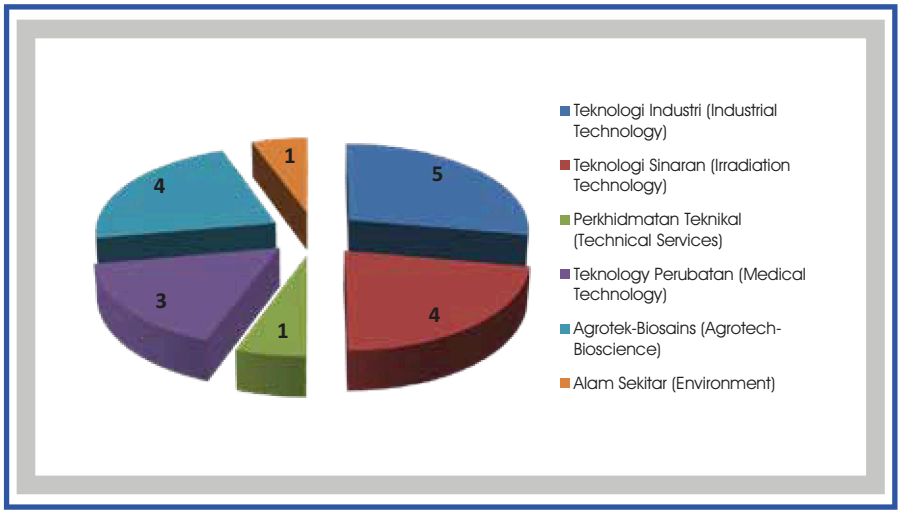
Pelbagai geran antarabangsa yang dianugerahkan seperti IAEA-CRP, FNCA, RCA dan IAEA-TC ditunjukan dalam Rajah 8.5 - 8.8.

8.5.2 International Fund

Various International grants awarded such as IAEA-CRP , FNCA, RCA and IAEA-TC are shown in Figures 8.5 - 8.8.

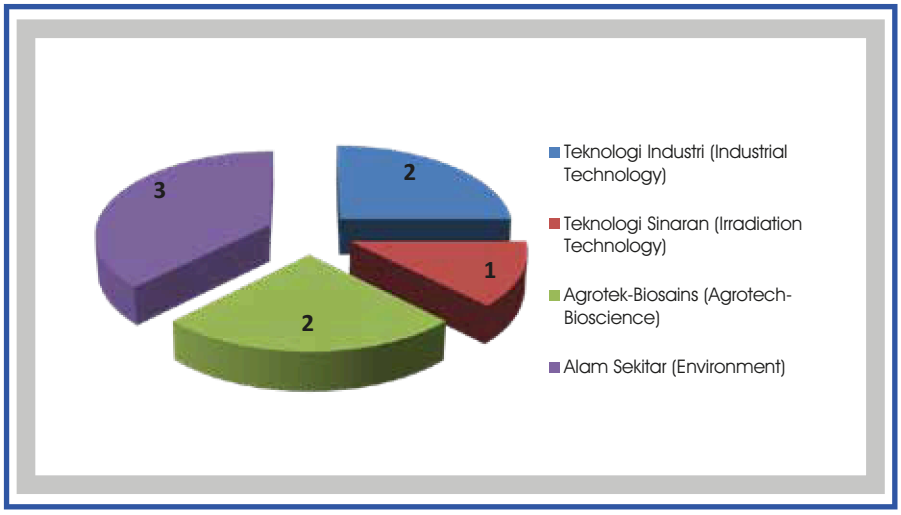


Rajah 8.5 Bilangan projek diluluskan kepada penyelidik Nuklear Malaysia daripada sumber antarabangsa
Figure 8.5 Number of projects granted to Nuclear Malaysia's researchers from International resources



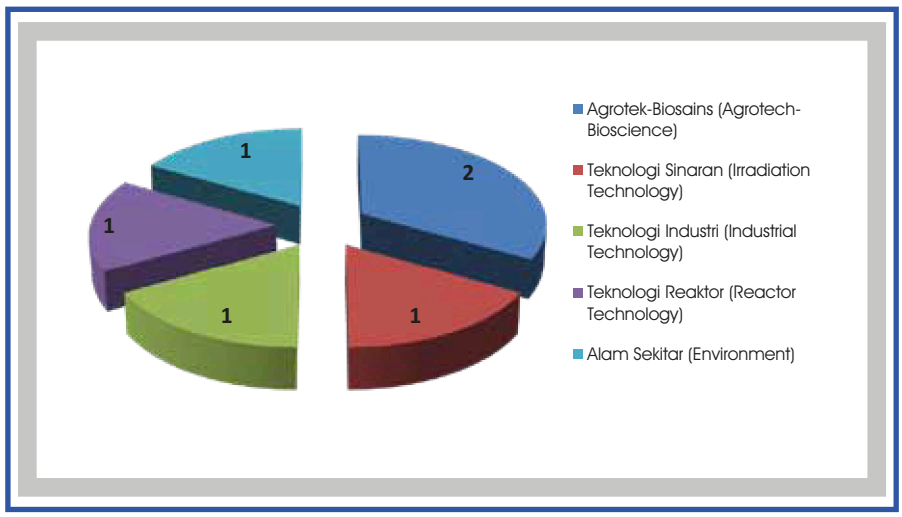
Rajah 8.6 Bilangan projek R&D yang dibiayai oleh geran IAEA-CRP untuk enam bidang utama

Figure 8.6 Number of R&D projects funded by IAEA-CRP grants for six major areas



Rajah 8.7 Projek R&D yang dijalankan dalam pelbagai bidang dengan kerjasama IAEA-RCA

Figure 8.7 R&D projects conducted in the various fields with the collaboration with IAEA-RCA grant.



Rajah 8.8 Projek R&D yang dijalankan dalam pelbagai bidang dengan kerjasama IAEA-TC

Figure 8.8 R&D projects conducted in the various fields with the collaboration with IAEA-TC.

8.6 Peralatan Spesifik

8.6.1 Pembilang Seluruh Badan

Alat Pembilang Seluruh Badan adalah satu sistem yang digunakan untuk mengenal pasti dan mengukur tahap keradioaktifan dalam badan. Sistem ini boleh digunakan secara rutin untuk mengukur tahap pengambilan dalaman radionuklid oleh pekerja sinaran yang terlibat dengan radinuklid pemancar gamma dan menggunakan 'High Purity Germanium ' sebagai pengesan. Di samping itu, sistem ini juga boleh digunakan untuk memantau pengambilan dalaman dalam kes-kes yang luar biasa / tidak sengaja bukan sahaja kepada pekerja sinaran, tetapi juga kepada orang awam.

8.6 Specific Device

8.6.1 Whole Body Counter

The Whole Body Counter is a system used to identify and quantify radioactivity inside the body. The system shall be used routinely to measure level of internal intake of radionuclides by radiation workers involves with gamma emitting radionuclide and used High Purity Germanium' as a detector. In addition, the system also could be used for monitoring of internal intake in abnormal/accidental cases not only to the radiation workers but also to the public.

Foto 8.12 Operator sedang mengukur tahap keradioaktifan dalam badan pekerja sinaran
Photo 8.12 Operator is measuring the level of radioactivity inside the body of radiation worker

8.6.2. Pembaca OSL

Alat pembaca *Landauer Microstar* memberikan pembacaan untuk dosimeter pendakilau rangsangan optik (OSL). Ia boleh menganalisa dua jenis dosimeter OSL iaitu jenis lencana INLIGHT/ALBEDO dan juga jenis cip iaitu NANODOT. Proses pembacaan OSL boleh dilakukan berulangkali menggunakan pembaca Microstar tanpa berlaku penyusutan nilai bacaan pada dosimeter OSL.

8.6.2 Optical Stimulated Luminiscene (OSL) Reader

Landaver Mocrostar give reading for optically stimulated luminiscene (OSL) disimeter. It can analyses two types of OSL which are INLIGHT/ALBEDO Badge and NANODOT Chip. OSL dosimeter reading process can be done repeatedly using Microstar reader without reading impairment occurs at OSL dosimeter

Foto 8.13 Operator sedang melakukan analisis chip NANODOT menggunakan pembaca OSL
Photo 8.13 Operator is conducting NANODOT chip analysis using OSL reader

8.6.3 *Automated Metaphase Finder System*

Dosimetri biologi digunakan untuk mengukur nilai julat radiasi (dos) sinaran mengion berdasarkan tahap kerosakan dan perubahan kromosom. Sistem *metaphase finder* berupaya merakam, mengenal-pasti dan menyimpan imej kromosom (metaphase). Imej yang disimpan dianalisis menggunakan perisian metafer dengan mengenalpasti kekerapan aberasi kromosom seperti disentrik dan translokasi. Dengan adanya peralatan ini, pemantauan dos radiasi kepada pekerja dan orang awam dapat dijalankan dengan cepat dan berkesan.

8.6.3 Automated Metaphase Finder System

Biological dosimetry is used to measure the radiation dose of ionizing radiation based on the damage and changes in the chromosome structure. Metaphase finder system is capable for recording, identifying and storing images of chromosomes (metaphase). The stored images are analyzed using metafer software to identify the frequency of chromosome aberrations such as dicentrik and translocation chromosomes. With the availability of this equipment, monitoring of radiation doses to workers and public can be carried out quickly and efficiently.

Foto 8.14 Analisis kromosom dijalankan dengan menggunakan perisian metafer.
Photo 8.14 Chromosome analysis is being conducted using metafer software

8.6.4 Kromatografi Cecair Prestasi Tinggi)

Kromatografi Cecair Prestasi Tinggi (UHPLC) berperanan untuk mengasingkan dan mengenalpasti sebatian bioaktif untuk pembangunan fitofarmasuitikal atau 'standardized herbal medicine'. Sistem ini berfungsi sebagai kromatografi pepejal-cecair yang bertekanan tinggi untuk tujuan pemisahan, pemencilan, penulenan, profil cap jari dan pengenalpastian komponen kimia aktif dari sampel atau campuran seperti farmaseutikal, nutraseutikal, makanan, produk semula jadi, biologikal, lipid, trigliserida, asid amino dan sebagainya.

8.6.5 *Solvent extracte*

Solvent Extractor berguna dalam proses pengekstrakan, pemisahan, pemencilan, penulenan dan pencirian komponen bioaktif ke atas ekstrak herba tumbuhan yang memberi kesan terapeutik terhadap sel kanser. Alat ini dapat menjalankan pembilasan sistem secara automatik, dan rawatan selepas pengekstrakan, iaitu membenarkan pembersihan sampel bagi menyingkirkan sebarang interferen enggunakan bahan penjerap. Ia sesuai digunakan untuk sampel farmaseutikal, nutraseutikal, produk semulajadi dan sebagainya.

8.6.4 Ultra High Performace Liquid Chromatography (UHPLC)

Ultra High Performance Liquid Chromatography, (UHPLC) involves isolation and identification of bioactive compounds and development of phytopharmaceuticals or 'standardized herbal medicine'. This system functions as a solid-liquid chromatography high pressure for separation, isolation, purification, fingerprints profiling and identification of active chemical components in any samples or mixtures such as pharmaceuticals, nutraceuticals, foods, natural products, biologicals, lipids, triglycerides, amino acids and etc.

8.6.5 Solvent extracte

Solvent Extractor involves extraction, separation, isolation, purification and characterization processes of bioactive components on herbal plant extracts with therapeutic effect on cancer cells. The equipment function allows automated rinsing of the system, and post-extraction treatment, i.e. allow in-line sample clean-up to remove interferences using sorbent. It is suitable for pharmaceuticals, nutraceuticals, natural products etc.

Foto 8.15 Analisis sebatian bioaktif dilakukan dengan Kromatografi Cecair Prestasi Tinggi
Photo 8.15 Bioactive compound is being conducted by using Ultra High Performance Liquid Chromatography

Foto 8.16 Operator sedang memasukkan herba tumbuhan untuk proses pengekstrakan bahan bioaktif.
Photo 8.16 Operator is placing plant herbs for bioactive compound extraction

8.6.6 Komputer Berprestasi Tinggi

Komputer kluster dilengkapi dengan perisian Monte Carlo N-Particle (MCNP) protocol membolehkan simulasi ekonomi neutron di reaktor dilakukan oleh penyelidik dan jurutera reaktor. Kluster terdiri dari lima nod komputer pelayan, satu nod master dengan setiap nod mempunyai enam pemproses. Sistem ini banyak diguna umpamanya dalam pembinaan perisai nuclear dan sinaran dosimetri.

8.6.6 High Performance Computer (HPC) Server

Cluster computer equipped with the Monte Carlo N-Particle (MCNP) program as a transport protocol that enabled scientists and engineers to simulate neutron economy in nuclear reactor. The cluster is comprised of five computer server for nodes, one master node with six-core each node. The system is widely used for other purposes such as in the construction of nuclear shielding and radiation dosimetry.

Foto 8.17 Kluster computer selari.
Photo 8.17 Parallel Computer cluster

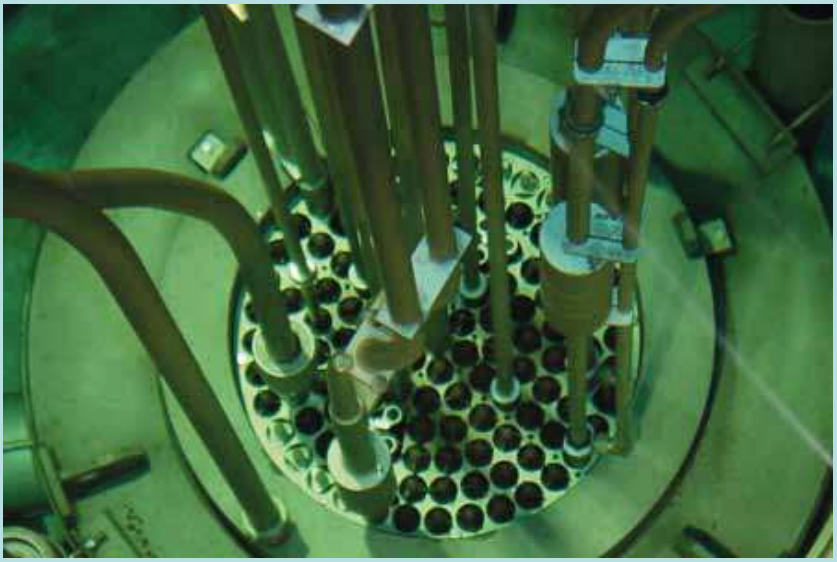


Foto 8.18 Pandangan atas teras reaktor TRIGA MARK II PUSPATI.
Photo 8.18 Top view of reactor core of TRIGA MARK II PUSPATI.

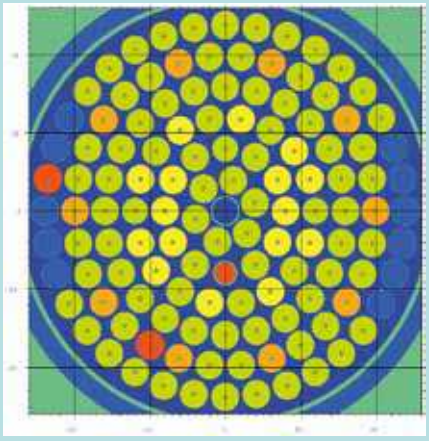
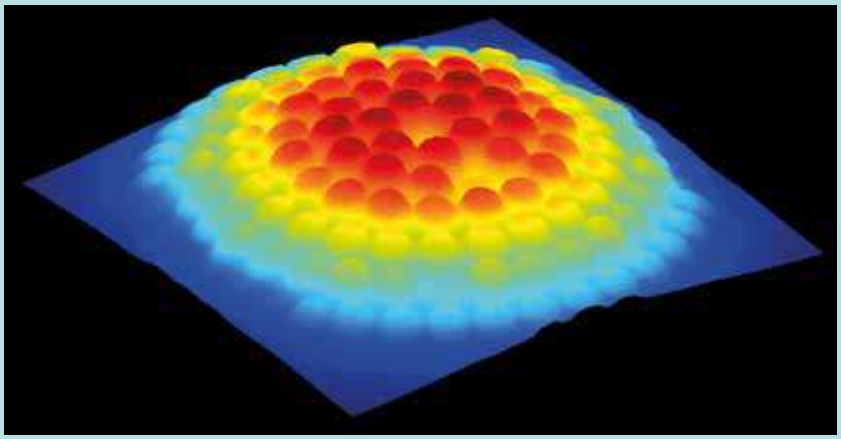


Foto 8.19 Data input bahan api dalam teras reaktor untuk MCNP bagi simulasi penghasilan sinaran nuklear di teras reaktor.
Photo 8.19 Input data of nuclear fuel in reactor core for MCNP used in the simulation of nuclear radiation production at reactor core.



Rajah 8.9 Simulasi taburan fluks neutron pantas di teras reaktor TRIGA MARK II dari MCNPX. Fluk neutron pantas 1.8x1013 n/cm2/s di sekitar teras dan semakin rendah sehingga 6x1012 n/cm2/s di bahan api lingkaran paling luar.
Figure 8.9 Simulated fast neutron flux distribution at TRIGA MARK II reactor core from MCNPX. Fast neutron flux 1.8x1013 n/cm2/s within core and reduces to 6x1012 n/cm2/s for the most outer ring nuclear fuels.

8.7 Kecemerlangan R & D

Nuklear Malaysia terus mempertingkatkan dan memantapkan penyelidikannya untuk memberi sokongan padu kepada hasrat MOSTI dalam usaha menjuarai penerokaan dalam penemuan saintifik dan penggerak inovasi. Pada tahun 2012, Nuklear Malaysia telah melaksanakan pelbagai perancangan untuk mencapai kecemerlangan dalam R&D bagi menempatkan agensi ini pada kedudukan yang inovatif, interaktif dan informatif. Antara pendekatannya ialah menerima lawatan teknikal, pelancaran teknologi, pameran saintifik, liputan media dan lain-lain aktiviti promosi R&D.

8.7 R & D Excellance

Nuclear Malaysia has continuously upgrading and sustaining its R&D to support MOSTI's effort in championing scientific discovery and being a mover for innovation. In 2012, Nuclear Malaysia has implemented various plans to make the agency more innovative, interactive and informative. Amongst the approaches were accepting the technical visits, technology launching, scientific exhibitions, media coverage and other R&D activities.

Foto 8.20 : TKSU(Sains), Y. Bhg Professor Datin Paduka Dr. Khatijah bt Mohd Yusoff yang diiringi Ketua Pengarah melawat pameran penyelidikan sempena Hari Inovasi Nuklear Malaysia 2012

Photo 8.20 : TKSU(Science), Y. Bhg Professor Datin Paduka Dr. Khatijah bt Mohd Yusoff accompanied by Director General visited research exhibition on Nuclear Malaysia Innovation Day 2012.

8.8 Pameran R&D

Pameran penemuan R&D adalah satu platfom untuk para penyelidik Nuklear Malaysia menguji tahap kepakaran dan mengenengahkan kecemerlangan R&D menerusi pertandingan reka cipta dan inovasi. Pada tahun 2012, Nuklear Malaysia telah menyertai sebanyak 29 pameran. Antara pameran-pameran tersebut adalah Malaysia Technology Expo 2012 (MTE 2012), Hari Inovasi Nuklear Malaysia 2012,Tahun Sains dan Gerakan inovasi Nasional 2012, i-INOVA USIM dan BioMalaysia 2012. Melalui pameran ini pemindahan teknologi dapat dilaksanakan serta dapat menjalankan tanggungjawab korporat dan sosial kepada masyarakat.

Foto 8.21 Penyelidik sedang menerangkan kepada pengunjung mengenai hasil penyelidikan yang dijalankan sempena pameran Bio Malaysia 2012

Photo 8.21 A researcher is explaning to visitors on research finding during Bio Malaysia 2012.

8.8 R&D Exhibitions

R&D Exhibitions serve as a platform for Nuclear Malaysia researchers to gauge their level of expertise and to highlight R&D excellence by participating in inventions and innovation-based exhibitions. In 2012, Nuclear Malaysia has been participated in 29 exhibitions. Among the exhibitions were Malaysia Technology Expo 2012 (MTE 2012), Nuclear Malaysia Innovation Day 2012, National Science and Innovation Movement Year 2012 (Tahun Sains dan Gerakan inovasi Nasional 2012), i-INOVA USIM and Bio Malaysia 2012. These exhibitions also act as a means for technology transfer as well as corporate and social responsibilities.

Foto 8.22 Penyelidik sedang menerangkan kepada pengunjung mengenai hasil penyelidikan yang dijalankan sempena pameran MTE 2012

Photo 8.22 A researcher is explaning to visitors on research finding during MTE 2012.

9. Pemindahan dan Pengkomersilan Teknologi

9. Transfer And Commercialisation Of Technology

9.1 Jalinan Kerjasama

9.1.1 Perjanjian Kerjasama dan Perjanjian Persefahaman

Sebanyak dua perjanjian kerjasama dan tiga perjanjian persefahaman telah ditandatangani oleh Nuklear Malaysia pada tahun 2012.

9.1 Collaboration Network

9.1.1 Memorandum of Agreement (MOA) and Memorandum of Understanding (MOU)

Two Memorandum of Agreements (MOA) and three Memorandum of Understandings (MOU) were signed by Nuclear Malaysia in 2012.

Jadual 9.1 :Senarai Perjanjian Kerjasama
Table 9.1: List of Memorandum of Agreements (MOA)

Bil. / *No.*	Syarikat / *Company*	Tajuk Projek / *Project Title*
1.	Valkua (M) Sdn Bhd	Pengurusan Logistik, Pemasarandan Promosi Perkhidmatan Pemonitoran NORM/TENORM yang disediakan oleh Agensi Nuklear Malaysia untuk Industri Minyak dan Gas *Logistics Management, Marketing and Promotion of NORM/TENORM Monitoring Service provided by Malaysian Nuclear Agency for Oil and Gas Industry*
2.	Selamat Indah Sdn Bhd	Pengeluaran Anak Benih In Vitro Pisang Tanduk menggunakan Teknik Kultur Tisu dan Sistem Bioreaktor *Production of in-vitro Pisang Tanduk seedlings through Tissue Culture and Bioreactor Technology*

Jadual 9.2 :Senarai Perjanjian Persefahaman
Table 9.2: List of Memorandum of Understandings (MOU)

Bil. / *No.*	Syarikat / *Company*	Tajuk Projek / *Project Title*
1.	Cerenkov Scientific Sdn Bhd	Penyelidikan dan Pengujian Penggunaan Oligokitosan Terhadap Tanaman Gaharu *Research and Testing of the Usage of Oligochitosan on Gaharu Crops / Plants*
2.	Usains Holdings Sdn Bhd	Mengendalikan Kursus 'Radiation Protection and Safety of Radiation Sources' – PGEC-9 *Handling of 'Radiation Protection and Safety of Radiation Sources' Course – PGEC-9*
3.	Persatuan Kebangsaan Kanser Malaysia	Kerjasama Penggalakkan Aplikasi Penggunaan Bahan Radiofarmaseutikal untuk Pengimbasan Tahap Keadaan Pesakit Kanser *Collaborative Partnership on Radiopharmaceutical Substance Application for Cancer Patient Condition Scanning*

Foto 9.1 : Majlis Menandatangani Dokumen Perjanjian Persefahaman antara Agensi Nuklear Malaysia dan Persatuan Kebangsaan Kanser Malaysia disaksikan oleh Datuk Seri Dr. Maximus Johnity Ongkili, Menteri Sains, Teknologi dan Inovasi (MOSTI).

Photo 9.1: Signing Ceremony Memorandum of Understanding Between Malaysian Nuclear Agency and National Cancer Society Malaysia witnessed by Datuk Seri Dr. Maximus Johnity Ongkili, Minister of Sains, Teknologi dan Inovasi (MOSTI).

Foto 9.2: Pertukaran Dokumen Perjanjian Persefahaman antara Agensi Nuklear Malaysia dan Persatuan Kebangsaan Kanser Malaysia disaksikan oleh Datuk Seri Dr. Maximus Johnity Ongkili, Menteri Sains, Teknologi dan Inovasi (MOSTI).

Photo 9.2: Exchange the Memorandum of Understanding between Malaysian Nuclear Agency and National Cancer Society Malaysia witnessed by Datuk Seri Dr. Maximus Johnity Ongkili, Minister of Sains, Teknologi dan Inovasi (MOSTI).

9.1.2 Perjanjian Kerahsiaan (NDA)

Nuklear Malaysia telah menandatangani Perjanjian Kerahsiaan dengan pihak syarikat yang berhasrat untuk mengkomersilkan teknologi nuklear di pasaran tempatan dan antarabangsa. Sebanyak sembilan Perjanjian Kerahsiaan telah ditandatangani pada 2012.

9.1.2 Non-disclosure Agreement (NDA)

Nuclear Malaysia has signed Non-Disclosure Agreements (NDA) with companies to commercialize R&D findings for local and international markets. A total of nine Non-disclosure Agreements (NDA) were signed in 2012.

Jadual 9.3: Senarai Perjanjian Kerahsiaan (NDA)
Table 9.3: List of Non-disclosure Agreements (NDA)

Bil. ***No.***	**Tajuk Kerjasama** ***Title of Collaboration***	**Syarikat** ***Company***
1.	Perkembangan dan Pembangunan Sebuah Kemudahan Pengilangan Produk Radiofarmaseutikal Sedia Guna di Agensi Nuklear Malaysia *Development and Setting-up a Facility at Malaysian Nuclear Agency to Manufacturing Ready to Use Radiopharmaceutical Products*	Transmedic Healthcare Sdn Bhd
2.	Pengurusan Lojistik, Pemasaran dan Promosi Servis Pemantauan NORM/TENORM yang disediakan oleh Agensi Nuklear Malaysia kepada Industri Minyak dan Gas. *Managing Logistics, Marketing and Promotion of NORM/TENORM Monitoring Services Provided by Malaysian Nuclear Agency to Oil and Gas Industry*	Valkua (M) Sdn Bhd
3.	Pembangunan dan Pengurusan Kemudahan Penyinaran Mintec-Sinagama di Agensi Nuklear Malaysia *Development and Management of MINTec-Sinagama Irradiation Facility at Malaysian Nuclear Agency*	Bizworth GammaRad Sdn Bhd
4.	Pemantauan Sinaran Tidak Mengion (NIR) *Monitoring of Non-Ionising Radiation (NIR)*	Triple A Engineering Sdn Bhd
5.	Memajukan Alat Meter Tinjau untuk Pra-Pengkomersilan *Development of Survey Meter for Pre-commercialisation*	Sinaran Utama Teknologi Sdn Bhd
6.	Pembangunan Fasiliti Alur Elektron 10 MeV *Development of 10MeV Electron Beam Facility*	Sinaran Utama Teknologi Sdn Bhd
7.	Pengkomersilan Aluminium Anode *Aluminium Anode Commercialisation*	TMM Engineering Sdn Bhd
8.	Pembangunan, Pengeluaran dan Pre-Pengkomersilan Alumina daripada Sisa Berjadual *Development, Production and Pre-commercialisation of Alumina Scheduled Waste*	Kinetic Chemicals (M) Sdn Bhd
9.	Pembangunan Sistem Perlindungan Penghakisan Tebing Sungai (Eco-Riverbank) Daripada Bahan Agrofiber: Riverprotec *Development of Riverbank Erosion Protection System (Eco-Riverbank) from Agrofiber Material: Riverprotec*	Muslim Global Intelek Sdn Bhd & Polycomposite Sdn Bhd

9.1.3 Projek Pembiayaan Dana Pra-Pengkomersilan (TechnoFund)

Satu projek kerjasama pra-pengkomersilan antara Nuklear Malaysia dan Selamat Indah Sdn Bhd mengenai pengeluaran anak benih in-vitro pisang tanduk menggunakan teknik kultur tisu dan sistem bioreactor telah menerima pembiayaan dari dana Pra-Pengkomersilan (TechnoFund), Kementerian Sains, Teknologi dan Inovasi (MOSTI) sebanyak RM1,435,000.00.

9.2 Pengurusan Harta Intelek

9.2.1 Intellectual Property (IP) Showcase

Salah satu aktiviti yang dijalankan ialah penganjuran IP Showcase 2012 pada 9-10 Mei 2012. IP Showcase 2012 ini dilancarkan bagi memberi kesedaran kepada warga Nuklear Malaysia akan kepentingan melindungi inovasi mereka dengan sistem perlindungan harta intelek. Sebanyak 25 gerai pameran mempersembahkan produk-produk dan proses yang berpotensi untuk dikomersialkan. Seminar bertajuk *Innovation: A Journey of an Invention to Wealth Creation* yang disampaikan oleh Prof. Dr. Mohd Hair Bin Bejo dari Fakulti Perubatan Veterinar, Universiti Putra Malaysia juga turut diadakan untuk mendengar pengalaman beliau dalam menguruskan harta intelek. Turut diadakan ialah bengkel dan klinik harta intelek di mana para pengunjung berpeluang untuk mengajukan sebarang soalan mengenai paten, hak milik, perlindungan undang-undang dan lain-lain kepada pakar yang diundang khas dari Norunnuha Sdn Bhd.

9.1.3 Pre-Commercialisation Project Funding (TechnoFund)

A collaborative project between Nuclear Malaysia and Selamat Indah Sdn Bhd on production of in-vitro pisang tanduk seedlings through tissue culture and bioreactor technology was granted Pre-Commercialisation (TechnoFund) funding by the Ministry of Science, Technology and Innovation (MOSTI) worth RM 1,435,000.00.

9.2 Intellectual Property Management

9.2.1 Intellectual Property (IP) Showcase

One of the activities organized is IP Showcase 2012 from 9-10 May 2012. IP Showcase 2012 was held to educate Nuclear Malaysia staff about the importance of protecting their innovation with intellectual property protection system. A total of 25 exhibition booths with various products and process with potentials to be commercialize. Besides exhibitions, a seminar titled Innovation: A Journey of an Invention to Wealth Creation given by Prof. Dr. Mohd Hair Bin Bejo from Veterinary Medicine Faculty, Universiti Putra Malaysia was also held to learn from his experience on managing intellectual properties. Also held was intellectual property workshops and clinic where visitors were given the opportunity to consult on matters related to patents, ownerships and legal protections among others by experts specially invited from Norunnuha Sdn Bhd.

Foto 9.3: Encik Mohd Khairul Adib bin Abd Rahman, Setiausaha Bahagian Industri MOSTI merasmikan Intellectual Property (IP) Showcase.
Photo 9.3: Encik Mohd Khairul Adib bin Abd Rahman, Under Secretary Industrial Division MOSTI officiate the Intellectual Property (IP) Showcase.

Foto 9.4: Pameran produk GITACHOC DELIGHT iaitu coklat berperisa ginseng tongkat ali sempena *Intellectual Property (IP) Showcase.*
Photo 9.4: Exhibition on GITACHOC DELIGHT product which is chocolate flavored ginseng tongkat ali during Intellectual Property (IP) Showcase.

Foto 9.5: Seminar bertajuk *Innovation: A Journey of an Invention to Wealth Creation* yang disampaikan oleh Prof. Dr. Mohd Hair Bin Bejo dari Fakulti Perubatan Veterinar, Universiti Putra Malaysia.
Photo 9.5: Seminar titled Innovation: A Journey of an Invention to Wealth Creation given by Prof. Dr. Mohd Hair Bin Bejo from Veterinary Medicine Faculty, Universiti Putra Malaysia.

Jadual 9.4: Senarai rekacipta yang dipamerkan semasa IP Showcase 2012
Table 9.4: List of inventions exhibited during IP Showcase 2012

Bil. ***No.***	**Tajuk Rekacipta** ***Title of Invention***	**Negara Difailkan** ***Country Filed***
1	Proses dan radas bagi pra-pengvulkanan lateks getah asli secara radiasi *Process and apparatus for natural rubber latex prevulcanisation by radiation*	Malaysia
2	Proses penghasilan makanan dari sisa serat berselulosa kelapa sawit *Process for producing feeds from the cellulosic fibrous wastes of oil palm*	Malaysia
3	Pembalut hidrogel *Hydrogel dressing*	Malaysia
4	Proses penyediaan larutan larut lesap bagi penyingkiran elemen radioaktif di dalam zircon dan mineral berkaitan *Process for preparing a leaching solution for removing radioactive elements in zircon and related minerals*	Malaysia
5	Hidrogel Kanji *Starch Hydrogels*	Malaysia China Taiwan Thailand Philippines Indonesia
6	Sintesis dan penghasilan minyak sawit berasaskan akrilat uretana (POBUA) bagi pematangan penyalut, adesif dan dakwat pencetak menggunakan UV/EB *Synthesis and production of palm oil based urethane acrylate (POBUA) for use in UV/EB curing of coatings, adhesives and printing inks*	Malaysia
7	Proses bagi penghasilan zircon bergred lebih tinggi *Process for producing higher-grade zircon*	Malaysia
8	Boleh matang Sinar Pelekat Peka Tekanan (PSA) daripada resin/oligomer minyak sawit dan metodologi pembuatannya *Radiation Curable Pressure Sensitive Adhesives (PSA) From Palm Oil Based Resins/Oligomers And Manufacturing Method Thereof*	Malaysia
9	Proses penukaran sisa radioaktif organic kepada seramik apatit *Process of Converting Radioactive Organic Waste into Apatite Ceramics*	Malaysia
10	Kaedah pembuatan hidroksil berasaskan minyak sawit yang mengandungi produk untuk digunakan dalam pembuatan bahan poliuretana *Method for manufacturing palm oil based hydroxyl containing products for use in making polyurethane materials*	Malaysia
11	Adunan polimer bertautsilang melalui penyinaran *Radiation cross-linkable polymer blends*	Malaysia

Bil. *No.*	Tajuk Rekacipta *Title of Invention*	Negara Difailkan *Country Filed*
12	Proses penghasilan alumina berketulenan tinggi *Process for producing high purity alumina*	Malaysia
13	Komposisi filem kanji bertautsilang melalui penyinaran dan kaedah penyediaannya *Radiation cross-linkable starch film composition and method of preparation thereof*	Malaysia
14	Sistem merakam imej akar *A root image capturing system*	Malaysia
15	Radas dan kaedah untuk mengukur tahap kematangan buah *Apparatus and method for measuring fruit ripeness*	Malaysia
16	Pengganti graf tulang dan kaedah penyediaannya *Bone graft substitutes and preparation method thereof*	Malaysia
17	Komposisi seramik bioaktif dan kaedah penghasilannya *Bioactive ceramic composition and method of manufacturing the same*	Malaysia
18	Lantanida menggantikan kalsium fosfat dan kaedah penghasilannya *Lanthanide substituted calcium phosphate and method of manufacturing*	Malaysia
19	Peralatan untuk mengesan saluran paip tersumbat *Apparatus for detecting blockages in pipelines*	Malaysia
20	Pes pembalut luka *Wound dressing paste*	Malaysia
21	Sistem penghantaran ubatan dalam tisu tulang *A drug delivery system in bone tissue*	Malaysia PCT
22	Modifikasi penyinaran terhadap adunan elastomer *Irradiation modification of elastomer blend*	Malaysia
23	Aloi aluminium untuk perlindungan katod *Aluminum alloy for cathodic protection*	Malaysia
24	Prob arus pusar dan kaedah pembuatannya *Eddy current probe and method of fabrication thereof*	Malaysia
25	Penambahbaikan peralatan pemprosesan haba *An improved thermal processing apparatus*	Malaysia

9.3 Khidmat Profesional dan Pengurusan Akaun Amanah

9.3.1 Prestasi Khidmat Profesional

Nuklear Malaysia melaksanakan perkhidmatan kepakaran professional dalam lima aktiviti utama seperti dalam Jadual 9.5. Nuklear Malaysia memberi khidmat kepada lebih 6,000 pelanggan. Jumlah pendapatan pada 2012 ialah RM 14.61juta.

9.3 Professional Services and Trust Fund Management

9.3.1 Performance of Professional Service

Nuclear Malaysia provided professional services in five major activities as shown in Table 9.5.The agency served over 6,000 customers generating income of RM 14.61 million.

Jadual 9.5: Pendapatan Khidmat Profesional
Table 9.5: Revenue for Professional Services

Bil. *No.*	**Aktiviti** *Activity*	**Pendapatan (RM Juta)** *Revenue (RM Million)*
1.	*Bekalan Produk* *Product Supply*	4.03
2.	*Pendidikan dan Latihan* *Education and Training*	2.65
3.	*Perkhidmatan Teknikal* *Technical Service*	7.17
4.	*Kontrak / Geran Penyelidikan / Runding Cara* *Contract / Research Grant / Consultation*	1.90
5.	*Dividen daripada Pelaburan* *Dividend from Investment*	0.12
	Jumlah Keseluruhan / ***Grand Total***	**14.61**

Jadual 9.6: Prestasi Pusat Khidmat dan Projek bagi Akaun Amanah
Table 9.6: Service Centre and Project Performance for Trust Account

	Peruntukan (RM Juta) ***Allocation (RM Million)***	**Perbelanjaan (RM Juta)** ***Expenses (RM Million)***	**Prestasi (%)** ***Performance (%)***
Pusat Khidmat *Service Centre*	15.00	13.08	87
IAEA *IAEA*	0.61	0.27	44
Projek Kerjasama *Collaboration Project*	11.14	1.80	16
TechnoFund *TechnoFund*	6.64	0.64	9
ScienceFund *ScienceFund*	0.76	0.45	59
Jumlah / ***Total***	**34.16**	**16.24**	**47**

9.4 Penaiktarafan Kemudahan Penyinaran Mesin Alur Elektron 1MeV

Loji Penyinaran ALURTRON di Agensi Nuklear Malaysia telah maju selangkah ke hadapan dengan menyinarkan *wire harness* bagi menghasilkan produk rintang haba. Penyinaran ini dilakukan dengan kerjasama syarikat Wonderful Compound Sdn Bhd (WCSB). *Wire harness* ini digunakan dalam kenderaan keluaran Proton Bhd. Kerjasama ini melibatkan penaiktarafan sistem penghantaran dan pengendalian wayar dan kabel (WUBHS). Kos penaiktarafan ini ditanggung oleh WCSB.

9.4 Upgrading of 1 MeV Electron Beam Irradiation Facility

ALURTRON Irradiation Plant at Nuclear Malaysia has been upgraded to produce heat resistant wire harness for Proton cars. This was achieved with the cooperation of Wonderful Compound Sdn Bhd (WCSB) and involved the upgrading of Wire Underbeam Handling System (WUBHS).

Foto 9.6: Pemecut
Photo 9.6: Accelerator

Foto 9.7: Pintu Perisai
Photo 9.7: Shielding Door

Foto 9.8: Sistem penghantaran dan pengendalian wayar (WUBHS)
Photo 9.8: Wire Under Beam Handling Systems

Foto 9.9: Sistem kawalan dan keselamatan
Photo 9.9: Control and Safety Systems

Foto 9.10: Capstan
Photo 9.10: Capstan

9.5 Program Promosi dan Pemasaran

9.5.1 Lawatan Industri

Pada tahun 2012, Nuklear Malaysia telah mengadakan 22 lawatan ke beberapa industri kecil dan sederhana (IKS). Lawatan ini bertujuan mempromosi hasil R&D dan kemudahan di Nuklear Malaysia yang boleh dimanfaatkan oleh industri berkenaan.

Nuklear Malaysia dengan kerjasama Valkua (M) Sdn Bhd melaksanakan program promosi khidmat NORM dan TENORM di Dubai, Brunei, Vietnam Oil & Gas Terminal dan Petronas Carigali Sdn. Bhd.

9.5 Promotion and Marketing Programmes

9.5.1 Industrial Visit

In 2012, Nuclear Malaysia held 22 visits to a number of Small and Medium Enterprise (SME). The purpose of the visits was to promote and market Nuclear Malaysia's R&D products and facilities.

Nuclear Malaysia in collaboration with Valkua (M) Sdn Bhd have conducted NORM and TENORM services promotional programmes namely in Dubai, Brunei, Vietnam Oil & Gas Terminal as well as Petronas Carigali Sdn Bhd.

Jadual 9.7 :Senarai lawatan industri
Table 9.7: List of industrial visits

Bil. *No.*	Syarikat *Company*
1	Transmedic Healthcare Sdn Bhd
2	Rakan Nusa Corporation Sdn Bhd
3	Petronas Carigali Sdn Bhd
4	TMM Engineering Sdn Bhd
5	SIRIM Berhad
6	Malaysian Biotechnology Corporation Sdn. Bhd.
7	Polycomposite Sdn Bhd
8	Wonderful Compound Sdn Bhd
9	Bizworth GammaRad Sdn Bhd
10	Kinetic Chemicals (M) Sdn Bhd
11	Biotropic Sdn Bhd
12	Lagenda Yakin Sdn Bhd
13	Terramed Healthcare Sdn Bhd
14	MyMedic Healthcare Sdn Bhd
15	Talian Saga Sdn Bhd
16	Sinaran UtamaTenologi Sdn Bhd
17	MSNT
18	Triple A Engineering Sdn Bhd
19	OREC Indusries Sdn Bhd
20	Kayu Gaharu (M) Sdn Bhd
21	Sinamed Sdn Bhd
22	Bioplast Sdn Bhd

Foto 9.11: Promosi khidmat pemantauan NORM/TENORM kepada Petronas Carigali Sdn. Bhd.

Photo 9.11: Promotion on NORM/TENORM monitoring service to Petronas Carigali Sdn. Bhd.

Foto 9.12: Lawatan dan perbincangan dengan Rakan Nusa Corporation Sdn Bhd dalam projek High Tech Alumina.

Photo 9.12: Visit and discussion with Rakan Nusa Corporation Sdn Bhd on project High Tech Alumina.

Foto 9.13: Lawatan ke pusat kemudahan SIRIM Berhad di Rasah, Rawang untuk projek Aluminium Anode.
Photo 9.13: Visit to facility center of SIRIM Berhad at Rasah, Rawang for Aluminium Anode project.

Foto 9.14: Lawatan dan perbincangan ke Polycomposite Sdn Bhd untuk projek RiverProtec.
Photo 9.14: Visit and discussion to Polycomposite Sdn Bhd for River Protec project.

Foto 9.15: Lawatan ke kilang pembuatan di Wonderful Compound Sdn Bhd bagi projek kerjasama "Development, Management, Operation and Maintenance of the 1MeV Electron Beam Machine (EBM-ELV4) and Production of Wire and Cable"
Photo 9.15: Visit to manufacturing plant at Wonderful Compound Sdn Bhd for collaboration project on "Development, Management, Operation and Maintenance of the 1MeV Electron Beam Machine (EBM-ELV4) and Production of Wire and Cable".

Foto 9.16: Lawatan ke tapak penanaman cili yang diaruhkan dengan Oligo-Chitosan bersama pihak syarikat Avid Focus Resources.
Photo 9.16: Site visit to chilli cultivation induced by Oligo-Chitosan with Avid Focus Resources.

9.5.2 Pameran

Nuklear Malaysia juga turut bergiat secara aktif dalam pameran di peringkat kebangsaan dan antarabangsa yang dikelolaoleh SME Corp. dan Kementerian Sains, Teknologi dan Inovasi (MOSTI).

9.5.2 Exhibitions

Nuclear Malaysia also actively involves in exhibitions at both national and international level conducted by SME Corp. and Ministry of Science, Technology and Innovation (MOSTI).

Jadual 9.8 :Senarai pameran yang disertai oleh Nuklear Malaysia
Table 9.8: List of Nuclear Malaysia exhibition

Bil. *No.*	**Pameran** *Exhibitions*
1.	Bio-Borneo, Kuching, Sarawak *Bio-Borneo, Kuching, Sarawak*
2.	Persidangan Minyak & Gas Sabah, Kota Kinabalu, Sabah *Sabah Oil & Gas Conference, Kota Kinabalu, Sabah*
3.	Ekspo SME Solution 2012, Kuala Lumpur *SME Solution Expo 2012, Kuala Lumpur*
4.	Ekspo Antarabangsa Sabah 2012, Sabah *Sabah International Expo 2012, Sabah*
5.	Techmart Antarabangsa Vietnam 2012, Vietnam *International Techmart Vietnam 2012, Vietnam*
6.	Bio-Johor – Persidangan & Pameran Ketiga Bioteknologi dan Biodiversiti Antarabangsa, Johor *Bio-Johor – 3rd International Biotechnology and Biodiversity Conference & Exhibition, Johor*

Foto 9.17: YB Datuk Sri Panglima Musa Haji Aman, Ketua Menteri Sabah menyampaikan sijil penyertaan kepada wakil Agensi Nuklear Malaysia di Persidangan Minyak & Gas Sabah, Kota Kinabalu, Sabah.
Photo 9.17: YB Datuk Sri Panglima Musa Haji Aman, Head Minister Sabah handling out a certificate of participation to the Malaysian Nuclear Agency at Sabah Oil & Gas Conference, Kota Kinabalu, Sabah.

Foto 9.18: Pameran di Ekspo SME Solution 2012, Kuala Lumpur
Photo 9.18: Exhibition at SME Solution Expo 2012, Kuala Lumpur

9.5.3 Pengiklanan

Bagi pengiklanan pula, sebanyak tiga iklan telah diterbitkan di dalam direktori, jurnal dan buku.

9.5.3 Advertising

For advertising, a total of three (3) advertisements have been published in directory, journal and book.

Jadual 9.9 :Senarai pengiklanan Nuklear Malaysia
Table 9.9: List of Nuclear Malaysia advertisements

Bil. *No.*	**Iklan** *Advertisement*
1.	Malaysian SME Business Directory terbitan November 2012 *Malaysian SME Business Directory published in November 2012*
2.	Malaysia Progress terbitanDisember 2012 *Malaysia Progress published in December 2012*
3.	Buku Program HOMECOMING VII, Pusat Alumni UPM terbitan November 2012 *HOMECOMING VII Programme Book, UPM Alumni Centre published in November 2012*

9.6 Projek Komuniti

Nuklear Malaysia juga telah menyelia projek-projek komuniti yang dibiayai oleh MOSTI bertujuan untuk membantu masyarakat tempatan menggunakan teknologi moden. Nuklear Malaysia dilantik sebagai agensi pelaksana bagi tujuh entity dalam projek herbaponik di bawah Program TAPMOSTI.

9.6 Community Projects

Nuclear Malaysia also supervised community projects funded by MOSTI to help local communities use modern technologies. Nuclear Malaysia was appointed as implementing agency for seven entities in herbaponic projects under the TAPMOSTI Programme.

Jadual 9.10 :Senarai entity projek herbaponik TAPMOSTI
Table 9.10: List of TAPMOSTI herbaponic entity projects

Projek *Project*	**Entiti** *Entity*	**Jumlah Peruntukan (RM)** *Total Allocation (RM)*
Projek Herbaponik Sayuran *Vegetable Herbaponic Project*	Koperasi Bela Rakyat Kawasan Sabak Berhad, DUN Sabak Selangor	50,000.00
	Jawatankuasa Keselamatan dan Kemajuan Kampung (JKKK) Kampung Tanjung Gahai, DUN Jelai, Pahang	50,000.00
	Jawatankuasa Kemajuan dan Keselamatan Kampung (JKKK) Long Bedian, DUN Telang Usan, Miri Sarawak	100,000.00
	Jawatankuasa Penyelaras dan Pembangunan Kawasan, DUN Rembia, Melaka	50,000.00
	Jawatankuasa Keselamatan dan Kemajuan Kampung (JKKK) Kampung Batu 6, DUN Sg. Lembing, Pahang	50,000.00
	Jawatankuasa Penyelarasan Mukim-Mukim, DUN Tangkak Johor	50,000.00
	Pertubuhan Belia Kerdau, DUN Kerdau, Pahang	50,000.00

Foto 9.19: Taklimat penanaman sayur-sayuran menggunakan kaedah herbaponik kepada komuniti DUN Jelai, Pahang.

Photo 9.19: Briefing on vegetable cultivation using herbaponic technique to entity at DUN Jelai, Pahang.

Foto 9.20: Projek komuniti dalam Program TAPMOSTI di DUN Jelai, Pahang.

Photo 9.20: Community project on TAPMOSTI Programme at DUN Jelai, Pahang.

10. Keselamatan dan Kesihatan Pekerjaan

10. Occupational Health and Safety

10. KESELAMATAN DAN KESIHATAN PEKERJAAN

Nuklear Malaysia telah melaksanakan pelbagai aktiviti untuk mewujudkan persekitaran tempat kerja yang selamat. Keutamaan diberikan bagi meningkatkan keupayaan Sistem Pengurusan Keselamatan, Kesihatan dan Persekitaran (SHE-MS) dan kesiapsiagaan kecemasan radiologi dan nuklear. Perkhidmatan teknikal dan kepakaran dalam keselamatan dan kesihatan turut diberi penekanan bagi menjamin keselamatan pekerja, orang awam dan alam sekitar.

10.1 SHE-MS

Penghayatan dan pelaksanaan SHE-MS dijayakan melalui pelbagai aktiviti seperti:

1. Mengemaskini sistem dan prosedur SHE mengikut OHSAS 18001 dan MS 1722.
2. Audit keselamatan dan sekuriti oleh LPTA dan IAEA Safeguard ke atas Reaktor TRIGA PUSPATI dan beberapa lagi audit keselamatan dalaman.
3. Mengendalikan kursus-kursus berkaitan keselamatan termasuk Kursus Keselamatan Sinaran dan Kesihatan Pekerja, Bengkel Keselamatan dan Kesihatan Sinaran
4. Latihan Kesiapsiagaan dan Respon Nuklear dan Radiologi.

10. OCCUPATIONAL HEALTH AND SAFETY

Nuclear Malaysia has implemented various activities to create a safe workplace. Priority is given to enhance Management System on Safety, Health and Environment (SHE-MS) and radiological and nuclear emergency preparedness. Technical services and expertise on safety and health are also emphasized to ensure the safety of workers, the public and the environment.

10.1 SHE-MS

Practice and implementation of the SHE-MS were achieved through:

1. *Updating the system and SHE procedures according to OHSAS 18001 and MS 1722.*
2. *Safety and security audit by AELB and IAEA Safeguard for TRIGA PUSPATI Reactor and several internal security audits.*
3. *Conduct safety courses including Course on Radiation Safety and Health for Workers, Workshop on Safety and Health*
4. *Nuclear and Radiological Emergency Preparedness and Responses.*

Foto 10.1 Bengkel Pembangunan Prosedur Kecemasan, Genting Highland

Photo 10.1 Workshop on Development of Emergency Procedures, Genting Highland

10.2 Kesiapsiagaan Kecemasan Radiologi Dan Nuklear

Nuklear Malaysia juga mengambil pelbagai langkah bagi meningkatkan kesiapsiagaan kecemasan radiologi dan nuklear seperti:

1. Mengemaskini prosedur kecemasan.
2. Menilai keupayaan kemudahan dan peralatan kecemasan secara berkala.
3. Mengadakan latihan kecemasan untuk AJK Kecemasan bagi menilai tempoh tindakan.
4. Mengadakan latihan kecemasan bagi kemudahan nuklear.

10.2 Radiological And Nuclear Emergency Preparedness

Nuclear Malaysia has taken various steps to improve radiological and nuclear emergency preparedness as:

1. *Updating the emergency procedures.*
2. *Periodic evaluation of the capability of emergency facilities and equipment.*
3. *Emergency training for members of Emergency Committee to assess the response time.*
4. *Nuclear facilities emergency training.*

Foto 10.2 Latihamal Ex-Storm-IV, Melaka
Photo 10.2 Training exercise Ex-Storm-IV, Melaka

Foto 10.3 Latihan kebakaran di Blok 29 dan 29T
Photo 10.3 Fire drill at Block 29 and 29T

Foto 10.4 Latihan kebakaran di Blok 23
Photo 10.4 Fire drill at Block 23

10.3 Perkhidmatan Teknikal dan Kepakaran Dalam Bidang Keselamatan dan Sekuriti

Selain daripada itu, perkhidmatan teknikal dan kepakaran dalam bidang keselamatan dan sekuriti diperkasakan melalui pelbagai aktiviti *seperti:*

1. Kursus, bengkel dan latihan bagi menambah bilangan perunding dan pakar.
2. Penyenggaraan, tentukuran dan penjagaan peralatan keselamatan.
3. Pemantauan sinaran di makmal dan kemudahan utama.
4. Khidmat pemonitoran stesen sinaran tidak mengion (NIR).
5. Khidmat kawalan mutu, tentukuran dan ujian ketebalan kesetaraan plumbum di dalam bidang radiologi diagnostik.

10.3 Technical Services and Expertise In The Field of Safety and Security

In Addition, The Technical Services And Expertise In The Field Of Safety And Security Were Strengthened Through Various Activities Such As:

1. *Courses, workshops and training to increase the number of consultants and experts.*
2. *Maintenance, calibration and care of safety equipment.*
3. *Radiation monitoring at laboratories and main facilities.*
4. *Monitoring services for non ionizing radiation (NIR) stations.*
5. *Quality assurance, calibration and lead equivalent testing services in diagnostic radiology.*

Foto 10.5 Pemantauan sinaran di Pusat Rawatan Sisa Radioaktif (Wastec) Blok 33
Photo 10.5 Radiation monitoring at Radioactive Waste Treatment Centre (Wastec) Block 33

Foto 10.6 Penyelenggaraan Stesen Pemantauan Radionuklid CTBT, RN42 Cameron Highland
Photo 10.6 Maintenance of Monitoring Radionuclide Station CTBT, RN42 Cameron Highland

11. Pembangunan Kuasa Nuklear

11. Nuclear Power Programme

11.0 PEMBANGUNAN KUASA NUKLEAR

11.1 Persediaan pembangunan Kuasa Nuklear

Rentetan daripada keputusan kerajaan Malaysia di dalam Rancangan Malaysia ke-10 (RMK 10) untuk mengkaji kemungkinan bahan nuklear sebagai salah satu sumber tenaga dalam Dasar Baru Tenaga, Nuklear Malaysia mempersiapkan diri bagi menyokong program pembangunan kuasa nuklear negara. Pelbagai aktiviti dijalankan melibatkan pembangunan keupayaan dan kemampuan warga kerja dalam aspek teknikal, perkongsian pengetahuan dan peningkatan sistem keselamatan program kuasa nuklear.

Antara aktiviti bagi persediaan pembangunan kuasa nuklear adalah penganjuran dan penglibatan dalam kursus, bengkel dan perbincangan seperti yang disenaraikan dalam Jadual 11.1

11.0 NUCLEAR POWER DEVELOPMENT

11.1 Preparation Of Nuclear Power Development

Following the decision by the Government of Malaysia in 10th Malaysia Plan (RMK 10) to conduct study on possibility of nuclear as energy option in New Energy Policy, Nuclear Malaysia has taken steps to support national nuclear power development programme. Various activities were carried out including the development of capacity and capability on technical aspects, knowledge sharing and enhancing security system on nuclear power programme.

Among the activities are organizing and participation in training courses, workshops and discussions. as listed in Table 11.1

Foto 11.1: Majlis Perasmian Seminar Perkongsian Pengalaman berkaitan Kuasa Nuklear di Malaysia
Photo 11.1: Opening Ceremony Seminar on Sharing Experience on Nuclear Power in Malaysia

Jadual 11.1: Aktiviti persediaan pembangunan kuasa nuklear
Table 11.1: Activities for preparation of nuclear power development

Bil. *No.*	Seminar / Bengkel / Perbincangan *Seminar / Workshop / Meeting*	Tarikh *Date*	Tempat *Place*
1	Bengkel TSO ke-4 bagi Pembangunan Penilaian Teknikal Bidaan untuk Program Kuasa Nuklear *4th TSO Workshop on Development of Technical Bidding Assessment for Nuclear Power Plant*	20 - 21 Mac	Nuklear Malaysia
2	Seminar "Wakasa Wan Energy Research Reactor" (WERC) berkenaan Perkongsian Pengalaman berkaitan Kuasa Nuklear di Malaysia *Wakasa Wan Energy Research Reactor (WERC) Seminar on Sharing Experience on Nuclear Power in Malaysia*	26 - 30 Mac	Nuklear Malaysia
3	Bengkel Kerjasama Teknikal Kitaran Bahan Api Nuklear IAEA *IAEA Technical Cooperation Workshop on Nuclear Fuel Cycle*	16 - 19 Apr	Nuklear Malaysia
4	Bengkel Pemurnian Silibus Sarjana Kejuruteraan Nuklear UTHM *Workshop on Syllabus Refinement for UTHM postgraduate course in Nuclear Engineering*	10 Sep	Nuklear Malaysia
5	Bengkel TSO ke-5 – Pembangunan Kaedah Penilaian Keselamatan : Pengurusan Penuaan dan Keputusan Penilaian *5th TSO Workshop – Development of Safety Methodology Assessment : Ageing Management and Evaluation Assessment*	3-4 Okt	Nuklear Malaysia
6	Kursus penilaian Kesan Alam Sekitar untuk Loji Kuasa Nuklear *Course on Environmental Impact Assessment for NPP*	15 – 19 Okt	Nuklear Malaysia
7	Bengkel Penilaian dan Pemilihan Teknologi Kuasa Nuklear *Workshop on Nuclear Power Technology Assessment and Selection*	16-19 Okt	Nuklear Malaysia
8	Pembangunan Strategi dan Pelan Perniagaan TSO serta Penubuhan Kaedah Penilaian untuk Membina Program Kuasa Nuklear *TSO strategy and Business Plan Development and Establishment of Evaluation Methodologies for Building Nuclear Power Program*	17-23 Okt	Nuklear Malaysia
9	Bengkel TSO kali ke-6 – Kaedah Pembangunan Dokumen PSAR bagi Loji Jana Kuasa Pertama Negara *6th TSO Workshop – PSAR Methodology Development for the 1st National Nuclear Power Plant*	30-31 Okt	Nuklear Malaysia

Foto 11.2: Peserta Bengkel Kerjasama Teknikal Kitaran Bahan Api Nuklear IAEA
Photo 11.2: Participants of IAEA Technical Cooperation Workshop on Nuclear Fuel Cycle

Foto 11.3: Peserta Bengkel Penilaian dan Pemilihan Teknologi Kuasa Nuklear
Photo 11.3: Participants of Workshop on Nuclear Power Technology Assessment and Selection

Pada tahun 2012, Nuklear Malaysia telah menerima kunjungan beberapa syarikat pengeluar reaktor nuklear seperti yang disenaraikan dalam Jadual 11.2

In 2012, Nuclear Malaysia received visits from nuclear reactor vendors as listed in Table 11.2

Jadual 11.2: Kunjungan syarikat pengeluar reaktor nuklear
Table 11.2: Visits from nuclear reactor vendors

Bil. *No.*	Seminar / Bengkel / Perbincangan *Seminar / Workshop / Meeting*	Tarikh *Date*	Tempat *Place*
1	Syarahan Teknologi Nuklear oleh wakil TOSHIBA *Nuclear Technology Talk by TOSHIBA Representative*	2 Feb	Nuklear Malaysia
2	Pembentangan Teknologi Reaktor SMART oleh Wakil KAERI *Presentation of SMART Reactor Technology by KAERI Representative*	19 Apr	Nuklear Malaysia
3	Syarahan Teknologi Nuklear oleh wakil NuScale *Nuclear Technology Talk by NuScale Representative*	3 Mei	Nuklear Malaysia
4	Syarahan Teknologi Nuklear oleh wakil ATMEA *Nuclear Technology Talk by ATMEA Representative*	4 Jun	Nuklear Malaysia

Foto 11.4: Peserta Syarahan Teknologi Nuklear oleh wakil TOSHIBA
Photo 11.4: Participants of Nuclear Technology Talk by TOSHIBA Representative

Foto 11.5: Syarahan Teknologi Nuklear oleh wakil ATMEA
Photo 11.5: Nuclear Technology Talk by ATMEA Representative

Program pembangunan kepakaran melalui latihan dalam dan luar negara meliputi pelbagai bidang disenaraikan seperti di Jadual 11.3
Programmes on development of expertise through training locally and abroad in various fields are shown in Table 11.3

Jadual 11.3: Bengkel dan latihan yang dihadiri kakitangan Nuklear Malaysia
Table 11.3: Workshop and training attended by Nuclear Malaysia personnel

Bil. *No.*	Seminar / Bengkel / Perbincangan *Seminar / Workshop / Meeting*	Tarikh *Date*	Tempat *Place*
1	Kursus Keselamatan Loji Kuasa Nuklear *Reactor Plant Safety Course*	8 Jan – 3 Feb	Tsuruga,Japan
2	Seminar Kuasa Nuklear Asia 2012 *Nuclear Power Asia Seminar 2012*	31 Jan – 1 Feb	Kuala Lumpur
3	Seminar Penggunaan Tenaga Nuklear Secara Aman dan Ketakcambahan Senjata Nuklear *Seminar on Peaceful Use of Nuclear Energy and Nuclear Non-Proliferation*	8-9 Feb	AELB, Malaysia
4	Forum Tenaga Nuklear sebagai Opsyen untuk Malaysia *Forum on Nuclear Energy as Option for Malaysia*	16 Feb	Kuala Lumpur
5	Bengkel Pengetahuan Penting bagi Penilaian Keselamatan Kebarangkalian (PSA) *Workshop on Essential Knowledge on Probabilistic Safety Assessment (PSA)*	27 Feb – 9 Mac	AELB, Malaysia
6	Mesyuarat Teknikal IAEA berkenaan Isu Alam Sekitar dan Program Kuasa Nuklear Baru *IAEA Technical Meeting on Environmental Issues in New Nuclear Power Program*	20 – 23 Mac	Vienna, Austria
7	Bengkel RELAP5 *Workshop on RELAP5*	12 - 16 Mac	AELB, Malaysia
8	Konferen Nuklear Pasifik (PBNC) ke-18 dan Persidangan Tahunan KAIF/KNS 2012 ke-27 *18th Pacific Basin Nuclear Conference (PBNC) and 27th KAIF/KNS Annual Conference 2012*	18 - 27 Mac	Busan, Korea
9	Konferen Teknikal Penyahtauliahan Kemudahan Nuklear dan Kemahiran Pemulihan Alam Sekitar *Practical Technical Conference on Nuclear Facility Decommissioning and Environmental Remediation Skills*	16 - 27 Apr	Argonne National Laboratory, Amerika Syarikat
10	Mesyuarat ke-3 bagi Kumpulan Kerja Teknikal bagi Infrastruktur Kuasa Nuklear *3rd Meeting of Technical Work Group on Nuclear Power Infrastructure (TWG-NPI)*	23 - 27 Apr	Vienna, Austria
11	Bengkel Serantau bagi Kajian Keselamatan Berkala *Regional Workshop on Periodic Safety Review*	30 Apr – 4 Mei	Bangkok, Thailand
12	Mesyuarat Teknikal IAEA bagi Pelaksanaan Pengurusan Pengetahuan dalam Sistem Pengurusan Bersepadu (IMS) Organisasi Nuklear *IAEA Technical Meeting on Implementing Knowledge Management in Integrated Management Systems (IMS) of Nuclear Organization*	7 - 11 Mei	Vienna, Austria

Bil. *No.*	Seminar / Bengkel / Perbincangan *Seminar / Workshop / Meeting*	Tarikh *Date*	Tempat *Place*
13	Mesyuarat Teknikal IAEA berkenaan Implikasi Kemalangan Nuklear Fukushima Daiichi, TEPCO terhadap Keselamatan Reaktor Penyelidikan *IAEA Technical Meeting on Implications of TEPCO's Fukushima Daiichi Accident on Safety of Research Reactors*	14 - 18 Mei	Vienna, Austria
14	Persidangan Teknikal IAEA berkenaan Pengurusan Kesan Kecemasan Radiologi *IAEA Technical Conference on Radiological Emergency Consequence Management*	21 - 25 Mei	Vienna, Austria
15	Bengkel Liabiliti Sivil bagi Kerosakan Nuklear *Workshop on Civil Liability for Nuclear Damage*	29 Mei	Vienna, Austria
16	Latihan Sambil Kerja: Termografi Aruhan Ultrasonik untuk mengesan dan menilai komponen Loji Kuasa Nuklear *On Job Training : Ultrasonic Induced Thermography for Defect Detection and Evaluation NPP Components*	14 Mei- 14 Jul	Kanada
17	Bengkel Peringkat Pertengahan RELAP5 *Intermediate RELAP5 Workshop*	7 - 11 Mei	Hanoi, Vietnam
18	Bengkel Kepentingan Bersama Penilaian Keselamatan Kebarangkalian (PSA) Peringkat Pertengahan Level 1 *Joint Essential Workshop on Intermediate Level 1 Probabilistic Safety Assessment (PSA)*	14 - 25 Mei	Hanoi, Vietnam
19	Mesyuarat Pakar Penggunaan Reaktor Penyelidikan untuk Latihan Pendidikan Nuklear IAEA *IAEA Consultancy Meeting On Application of Research Reactor to Nuclear Education Training*	4 - 8 Jun	Prague, Republik Czech
20	Kursus Musim Panas Antarabangsa UKM-KAIST ke-4 *UKM-KAIST 4th International Summer School*	2 - 17 Jul	UKM, Malaysia
21	Kursus Latihan Antara Rantau Mengenai Kaedah dan Alat bagi Penilaian Teknologi Loji Jana Kuasa Nuklear *Interregional Training Course on Tools and Methodologies for NPP Technology Assessment*	11-13 Jul	Vienna, Austria
22	Latihan Penyelidik dan Jurutera Muda Asia *Training of Asian Young Researcher and Engineer*	22 Jul - 11 Ogos	JMTR, Japan
23	Pra Pemindahan Teknologi bagi Projek ReDICS *Pre-Technology Transfer Programme for Reactor Digital Instrumentation & Control System (ReDICS) project*	1 Ogos	KAERI, Korea
24	Latihan Fellowship IAEA-EERRI ke-6 *IAEA-EERRI 6th Fellowship Training*	24 Sep- 2 Nov	Austria, Slovenia & Republic Czech
25	Bengkel Serantau Jaringan Keselamatan Nuklear Asia (ANSN) berkenaan Ujian Kesihatan Pekerjaan dan Psikologi serta Penilaian terhadap Kakitangan Loji Jana Kuasa Nuklear *Asian Nuclear Safety Network (ANSN) Regional Workshop on Occupational Health and Psychological Test and Evaluation of NPP Staff*	3-7 Sep	Wuhan, China
26	Lawatan Teknikal ke BATAN: Pembuatan Bahan Api Nuklear *Technical Visit to BATAN : Nuclear Fuel Fabrication*	11-17 Nov	BATAN, Indonesia

Foto 11.6 Peserta Pra Pemindahan Teknologi bagi Projek ReDICS
Photo 11.6 Participants of Pre Technology Transfer Program on ReDICS project

Foto 11.7 Latihan Fellowship IAEA-EERRI ke-6
Photo 11.7 IAEA-EERRI 6th Fellowship Training

Foto 11.8 Peserta Program Latihan Penyelidik dan Jurutera Muda Asia di Jepun
Photo 10.8 Participants of Training of Asian Young Researcher and Engineer in Japan

11.2 Kendalian Dan Penyenggaraan Reaktor Triga Puspati

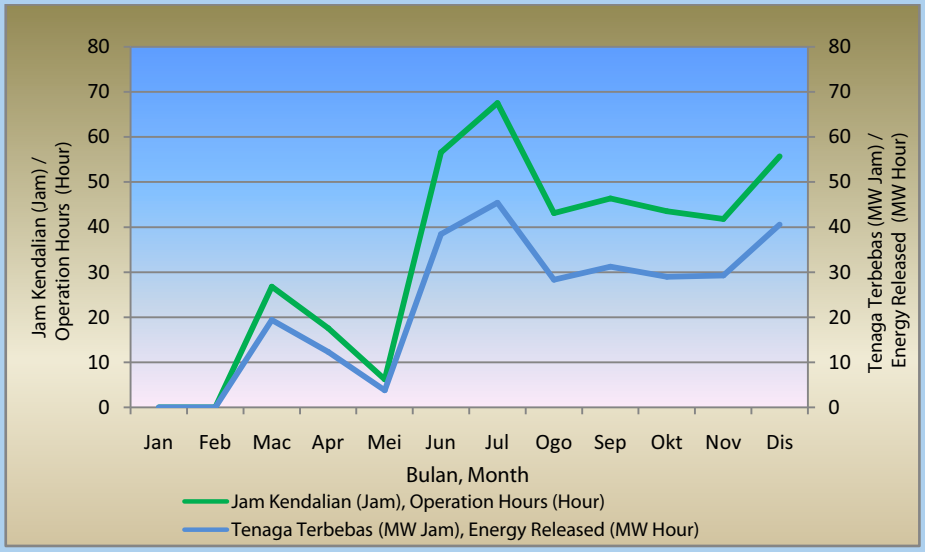
Tahun 2012 merupakan ulang tahun ke-30 Reaktor TRIGA PUSPATI (RTP) beroperasi setelah mencapai kegentingan pertama pada 28 Jun 1982. RTP kekal memainkan peranan yang besar terhadap pembangunan aktiviti penyelidikan dan latihan dalam bidang nuklear di Malaysia. Aktiviti yang telah dijalankan sepanjang tahun 2012 disenaraikan dalam Jadual 11.4

11.2 Operation And Maintenance Of Puspati Triga Reactor

2012 is the 30th anniversary of the Reaktor TRIGA PUSPATI (RTP) since its first criticality on 28 June 1982. RTP played an important role in the development of research and training activities in the nuclear field in Malaysia. The activities implemented during the year 2012 are listed in Table 11.4

Jadual 11.4 : Aktiviti tahun 2012 adalah:
Table 11.4 : 2012 activities are:

AKTIVITI	*ACTIVITIES*
1. Program pematuhan peraturan lesen LPTA	*1. RTP compliance programme with LPTA license regulations*
2. Kendalian RTP secara selamat dan sifar kemalangan	*2. Safely RTP operations with zero accident*
3. Perkhidmatan teknikal dan perundingan kepada aktiviti penyelidikan dan pendidikan	*3. Technical and consultancy services for research and educational activities*
4. Menerima dan menilai permohonan penyinaran untuk tujuan penyelidikan.	*4. Receive and evaluate irradiation requests for research purposes.*
5. Taklimat kepada pelawat RTP.	*5. Briefing to RTP visitors.*
6. Khidmat rundingan kepada pelajar universiti yang menjalankan aktiviti penyinaran dan penyelidikan di reaktor.	*6. Consultancy services to university students on irradiation activities and research at the reactor.*
7. Program penyenggaaraan separa tahun dan tahunan.	*7. Semi-annual and annual maintenance*
8. Latihan pensijilan pengendali reaktor baru	*8. Training for the certification of new reactor operator*



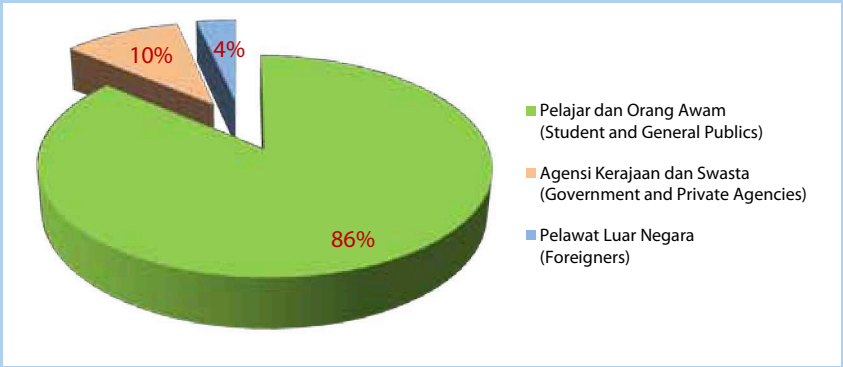
Rajah 11.1 Data Kendalian RTP Tahun 2012
Figure 11.1 2012 RTP Operations Data

Jadual 11.5 Khidmat Penyinaran Sampel tahun 2012
Table 11.5 2012 Sample Irradiation Service

Penyinaran Sampel (Sample Irradiation)	Jenis Kemudahan Penyinaran *(Type of Irradiation Facility)*				
	Rak Berputar (Rotary Rack)	*Sistem Penghantaran Pneumatik (Pneumatic Transfer System)*	*Radiografi Neutron, NuR2 (Neutron Radiography,NuR2)*	*Small Angle Neutron Scattering, SANS (Serakan Neutron Bersudut Kecil, SANS)*	*Tiub Kering (Dry Tube)*
Jumlah Penyinaran (Total Irradiation)	*2555*	*591*	*2*	*21*	*2*

Pada 2012, RTP telah dikunjungi lebih 2500 pelawat daripada pelbagai agensi kerajaan, syarikat swasta, pelajar universiti, peserta kursus dan pelawat luar negara. RTP turut dibuka kepada lawatan umum semasa 'Sambutan Hari Inovasi Agensi Nuklear Malaysia' yang telah berlangsung pada 2-4 Julai 2012.

In 2012, RTP has receive more than 2500 visitors from various government agencies, private componies, university students, course participants and foreign visitors. RTP was also open to the public during the 'Malaysian Nuclear Agency Innovation Day' which was held on 2-4 July 2012.



Rajah 11.2: carta kehadiran pelawat ke RTP
Figure 11.2: Chart of RTP visitors

Foto 11.9: Taklimat tentang sistem reaktor oleh pegawai Nuklear Malaysia
Photo 11.9: Briefing on reactor system by Nuclear Malaysia officers

Foto 11.10: Taklimat tentang sistem kawalan reaktor
Photo 11.10: Briefing on reactor control system

Foto 11.11: Penerangan penggunaan kemudahan Serakan Neutron Bersudut Kecil (SANS) dalam penyelidikan
Photo 11.11: Briefing on Small Angle Neutron Scattering (SANS) facility in research

Jadual 11.6 Aktiviti penyelidikan dan penambahbaikan ciri keselamatan Reaktor TRIGA PUSPATI
Table 11.6 Research activities and safety improvements of Reaktor TRIGA PUSPATI

AKTIVITI	*ACTIVITIES*
1. Kajian kebolehlaksanaan naiktaraf teras reaktor.	*1. Feasibility study on reactor core upgrading.*
2. Penaiktarafan konsol dan sistem instrumentasi.	*2. Console and Instrumentation upgrading.*
3. Pembangunan dokumentasi sistem-sistem RTP.	*3. Systems documentation development.*
4. Penambahbaikan Sistem Pengurusan Keselamatan.	*4. Safety Management Systems Improvement.*
5. Penambahbaikan Program Kendalian dan Penyenggaraan.	*5. Operations and Maintenance Programme improvement.*
6. Pembangunan Program Pengurusan Penuaan.	*6. Aging Management Programme Development.*
7. Penyediaan Manual Sistem Pengurusan Bersepadu (IMS).	*7. Preparation of Integrated Management System (IMS) manual.*
8. Pengemaskinian Laporan Analisis Keselamatan (SAR).	*8. Updating the Safety Analysis Report (SAR).*
9. Kajian kebolehlaksanaan penggunaan lubang alur neutron bagi pemasangan kemudahan penyelidikan yang baru	*9. Feasibility study on utilisation of neutron beamport for the installation of new reseach facility*
10. Kajian keselamatan radiologi persekitaran dewan reaktor.	*10. Radiological safety studies in reactor hall.*
11. Pemonitoran keradioaktifan air dalam tangki reaktor	*11. Radioactivity monitoring of water in reactor tank*
12. Pembangunan program kitaran bahan api dan pengurusan sisa	*12. Nuclear fuel cycle and waste management development program*
13. Kajian keselamatan reaktor menggunakan kaedah Penilaian Keselamatan Kebarangkalian (PSA)	*13. Reactor safety study using Probabilistic Safety Assessment (PSA)*
14. Program pengurusan teras dan bahan api	*14. Core and fuel management programme*
15. Simulasi neutronik dan termalhidraulik di reaktor	*15. Neutronic and thermalhydraulic simulation in reactor*
16. Kajian bekas pemindahan dan kolam penyimpanan bahan api terpakai RTP	*16. Study on spent fuel transfer cask and spent fuel pool.*
17. Kajian penyusutan bahan api nuklear	*17. Study on nuclear fuel depletion*

Foto 11.12: Penyenggaraan dan pengurusan penuaan RTP
Photo 11.12: Maintenance and RTP ageing management

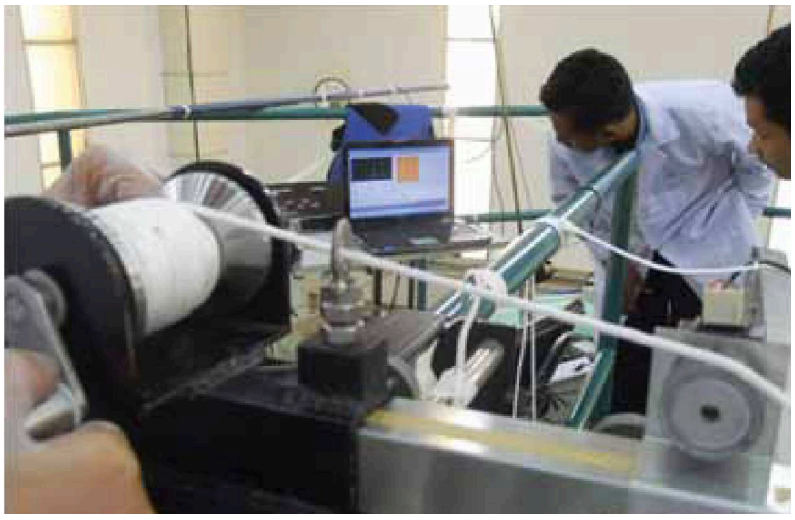


Foto 11.13: Pemeriksaan keutuhan sistem tangki reaktor
Photo 11.13: Reactor tank integrity inspection

Foto 11.14: Pemasangan sistem pemonitoran pelepasan udara RTP
Photo 11.14: Installation of RTP stack monitor system

Foto 11.15: Kajian perisaian sinar gama daripada sampel tersinar
Photo 11.15: Study on shielding of gamma ray from irradiated samples

Foto 11.16: Pemetaan taburan fluks neutron di turus terma RTP
Photo 11.16: Neutron flux distribution mapping in RTP thermal column

12. Sokongan Teknikal

12. Technical Support

12.1 Pembangunan Fizikal

Pencapaian utama dalam pembangunan fizikal untuk naik taraf kemudahan Nuklear Malaysia dapat dilihat menerusi kemajuan dan penyiapan projek projek yang menggunakan peruntukan Pembangunan berjumlah Rm530,000. Perbelanjaan ini dijelaskan melalui Rajah 12.1.

12.1 Physical Development

The main achievement in physical development is the upgrading of Nuclear Malaysia's facilities can be seen through the progress and completion of projects. These projects use development budgetary totaling RM530, 000. The expenses are illustrated as in Figure 12.1.

Rajah 12.1: Perbelanjaan Peruntukan Pembangunan Fizikal 2012
Figure 12.1: Expenditure of Physical Development Budget

Projek naiktaraf kemudahan bangunan Pusat Teknologi dan Kualiti (PTK) memberikan peningkatan keselamatan dan keselesaan bagi pengguna. Suasana ini menambahkan motivasi warga kerja melaksanakan tugas dan meningkatkan produktiviti. Sistem kawalan keselamatan melalui sistem kad keselamatan dan pemasangan CCTV meningkatkan tahap keselamatan kawasan kerja.

The upgrading project for Technology and Quality Centre facility enhances safety and comfort for the users, leading to higher motivation and productivity. The installation of the security system via security card system and CCTV improves safety at workplace.

Foto 12.2: Rail keselamatan kawasan bangunan PTK
Photo 12.2: Safety railing of PTK Building

Foto 12.3: Sistem akses Bangunan PTK
Photo 12.3: Safety railing of PTK Building

12.2 Pengurusan Fasiliti dan Prasarana

Operasi penyenggaraan aset merangkumi perkhidmatan-perkhidmatan berikut:-

- Operasi dan penyenggaraan aset tak alih (pembaikan bangunan dan kemudahan).
- Operasi dan penyenggaraan prasarana kemudahan awam melibatkan pembaikan ke atas peralatan dan sistem mekanikal, elektrikal, IT (pelayan , jaringan dan e-mel), pengesan dan pencegah kebakaran serta siaraya.
- Operasi dan penyenggaraan aset alih (penyenggaraan dan baikpulih alatan saintifik, tentukuran, penyenggaraan audio visual dan pembaikan kenderaan jabatan).
- Operasi dan penyenggaraan sistem perkhidmatan ICT (pengurusan penyenggaraan sistem komputer berkala).

Jumlah kos tahunan perbelanjaan berkaitan adalah sebanyak RM 5.3 juta.

12.2 Facilities and Infrastructure Management

Asset maintenance operations include the following services: -

- *Operation and maintenance of fixed assets (buildings and facility improvements).*
- *Operation and maintenance of public facilities infrastructure, repairs of equipment for mechanical, electrical, IT (servers, network and e-mail), detectors and fire prevention with public address systems.*
- *Operation and maintenance of non-fixed assets (maintenance and repair of scientific instruments, calibration, maintenance and repair of audio visual and department vehicles).*
- *Operation and maintenance of ICT services (periodic management for computer maintenance system).*

Total annual expenditure for related works amounted to RM 5.3 million.

Foto 12.4: Aktiviti penyenggaraan prasarana Nuklear Malaysia
Photo 12.4: Insfrastructure maintenance activities in Nuclear Malaysia

Program penyenggaraan prasarana dirancang secara terperinci melalui kaedah penyenggaraan komprehensif, berkala dan terus melalui sistem aduan Helpdesk. Penyenggaraan ini menyokong aktiviti R&D dan pusat-pusat khidmat Nuklear Malaysia. Penggunaan Helpdesk terbukti memudahkan dan meningkatkan kecekapan penyenggaraan terutama dengan pertambahan bilangan aset Nuklear Malaysia.

12.2.1 Penyenggaraan komprehensif

Penyenggaraan komprehensif banyak membantu menguruskan kerja pembaikan dengan lancar. Program ini dilaksanakan melalui pemberian kontrak secara pukal kepada kontraktor untuk menguruskan pembaikan sesuatu kemudahan. Melalui kaedah ini pengurangan kos dan peningkatan kecekapan dapat dicapai. Kerja-kerja komprehensif yang telah dilaksanakan adalah seperti berikut:-

- Penyenggaraan bangunan di Kompleks Nuklear Malaysia
- Penyenggaraan prasarana di Kompleks Nuklear Malaysia
- Penyenggaraan sistem penyaman udara

Infrastructure maintenance programme is planned in detail through a comprehensive, periodic and direct through Helpdesk. This maintenance support Nuclear Malaysia R&D and service centers. Helpdesk has proven to facilitate and improve the efficiency of maintenance, especially with the increasing number of Nuclear Malaysia's assets.

12.2.1 Comprehensive Maintenance

Comprehensive maintenance helps to manage repair works smoothly. The programme is implemented through the award of lump sum contracts to contractors to manage the repair of a facility. Through this method cost reduction and efficiency improvement can be achieved. Comprehensive work implemented are as follows: -

- *Maintenance of buildings in Nuclear Malaysia Complexes*
- *Maintenance of infrastructure in Nuclear Malaysia Complexes*
- *Maintenance of air conditioning system*

12.5: Aktiviti penyenggaraan komprehensif di Nuklear Malaysia
12.5: Comprehensive maintenance activities in Nuclear Malaysia

12.2.2 Sistem penyenggaraan berkala

Sistem penyenggaraan berkala merupakan aspek yang dititikberatkan oleh pengurusan Nuklear Malaysia. Penyenggaraan ini melibatkan bangunan dan loji, kemudahan asas (air,elektrik dan kelengkapan mekanikal), kebersihan perkarangan, landskap dan kontrak penyenggaraan kenderaan.

12.2.2 Periodic maintenance system

Periodic maintenance system is given priority by the Nuclear Malaysia management. The maintenance involves building and plant, utilities (water, electric and mechanical equipment), compound cleanliness, landscaping and contract maintenance of vehicles.

12.6: Aktiviti penyenggaraan berkala untuk perkarangan dan bangunan di Nuklear Malaysia
12.6: Landscaping and building periodic maintenance activities in Nuclear Malaysia

12.2.3 Pengurusan Aduan menggunakan Sistem Helpdesk

Sistem ini mula dilaksanakan pada 2010 dan hasilnya dapat dimanfaatkan pada 2012. Pelbagai aduan telah diterima untuk perhatian dan tindakan. Sistem ini dapat memantau penyelarasan kerja penyenggaraan dengan teratur. Sistem aduan berkomputer ini amat baik oleh kerana dapat memberi maklum balas yang tepat dan terperinci. Sistem ini telah membantu mempertingkatkan pengurusan penyenggaraan di Nuklear Malaysia dan dapat memberi maklumat berikut:

- Merekodkan aduan secara atas talian
- Memaklumkan kepada pengadu status aduan melalui e-mel
- Mengagihkan tugas –tugas mengikut jenis pembaikan
- Memudahkan semakan

12.2.4 Perkhidmatan ICT

Pengubahsuaian Bilik Penyelenggaraan Komputer Pusat IT telah dilaksanakan pada bulan September 2012. Kerja-kerja tersebut melibatkan pembesaran bilik pelayan. Kerja ini dapat mengurangkan kesesakan dalam bilik pelayan sedia ada dan menyambung terus ke bilik penyenggaraan IT.

12.2.3 Helpdesk System

The system was developed in 2010 and adopted for official use in 2012. Various complaints have been received for attention and action. This system can monitor proper coordination of maintenance work. The computerized complaint system enables to provide accurate information and detailed response. This system has already helped improve maintenance management in Nuclear Malaysia and provide the following information:

- *Record on-line complaints*
- *Inform complainant of maintenance status via e-mail*
- *Distribute the tasks according to the type of repairs*
- *Facilitate review*

12.2.4 ICT Services

Modification of the Computer Maintenance Room has been performed in September 2012. The work involved the expansion of the server room. This work enables reduction of congestion in the existing server room and connects directly to the IT maintenance room.

13. Hubungan Dan Kerjasama Antarabangsa

13. International Cooperation and Relationship

13.1 Kerjasama Serantau Dan Antarabangsa

Nuklear Malaysia bergiat aktif di dalam rangka kerjasama serantau dan antarabangsa seperti Perjanjian Kerjasama Serantau bagi Penyelidikan, Pembangunan dan Latihan berkaitan Sains dan Teknologi Nuklear di Asia dan Pasific (RCA), Forum Kerjasama Nuklear di Asia (FNCA), Agensi Tenaga Atom Antarabangsa (IAEA) dan Suruhanjaya Persediaan Triti Pengharaman Menyeluruh Ujian Senjata Nuklear (CTBTO PrepCom). Kerjasama ini bertujuan membangunkan sains dan teknologi nuklear secara aman di Malaysia. Skop kerjasama merangkumi bantuan kepakaran, penempatan dan latihan pegawai di bawah program fellowship dan lawatan saintifik, penyertaan dan penganjuran persidangan, mesyuarat teknikal, seminar, bengkel dan kursus.

13.1.1 Persidangan Agung IAEA ke-56

Persidangan Agung IAEA ke-56 telah diadakan pada 17-21 September 2012 di Vienna, Austria. Delegasi Malaysia diketuai oleh Ketua Pengarah Nuklear Malaysia untuk mewakili, menyuarakan dan mempertahankan pendirian Malaysia dalam pelbagai isu berbangkit terutamanya semasa rundingan resolusi, demi menjaga kepentingan negara dalam perkembangan dasar, hala tuju dan perancangan aktiviti IAEA. Delegasi Malaysia turut menghadiri mesyuarat dua hala bersama dengan Bahagian Kerjasama Teknikal IAEA, Forum Saintifik IAEA dan mengadakan lawatan saintifik ke Loji Kuasa Nuklear Zwentendorf di Austria.

13.1 Regional And International Cooperation

Nuclear Malaysia has been actively involved in the framework of regional and internatiol cooperation such as the Regional Cooperation Agreement for Development and Training related to Nuclear Science and Technology in Asia and the Pacific (RCA), Forum for Nuclear Cooperation in Asia(FNCA), International Atomic Energy Agency (IAEA) and Comprehensive Nuclear Test Ban Treaty Organisation Preparatory Commission (CTBTO PrepCom). This cooperation is established for the development of peaceful applications of nuclear science and technology in Malaysia. The scope comprises technical assistance, attachment under the fellowship and scientific visit programme, participation and organisation of conferences, technical meetings, seminars, workshops and training courses.

13.1.1 The 56th IAEA General Conference

The 56th IAEA General Conference was held on 17-21 September 2011 in Vienna, Austria. Malaysia's delegation was lead by Director General of Nuclear Malaysia to represent and defend Malaysia's stance in issues arising from the resolution, to show our interest and support in policy development, mission and planning of IAEA activities. The delegation also attended bilateral meeting, scientific forum and visited Zwentendorf Nuclear Power Plant

Foto 13.1: Ketua Pengarah Nuklear Malaysia semasa berucap di Persidangan Agung IAEA ke-56.
Photo 13.1: Director General of Nuclear Malaysia addressing 56th IAEA Annual General Meeting.

13.1.2 Mesyuarat Wakil-wakil Kebangsaan untuk Perjanjian Kerjasama Serantau (RCA) ke-34

Mesyuarat Wakil-wakil Kebangsaan untuk RCA yang ke-34 telah diadakan di Beijing, Republik Rakyat China pada 17– 20 April 2012. Mesyuarat ini telah membincangkan perkembangan semasa program RCA bagi kitaran 2011-2012 dan hala tuju program untuk kitaran 2014-2015. Ini diikuti dengan permeteraian perjanjian lanjutan RCA bagi kali kelima untuk kitaran 2012-2017 yang telah disempurnakan pada 8 Jun 2012.

13.1.3 Mesyuarat dan Persidangan Umum RCA (RCA GCM)

Mesyuarat dan Persidangan Umum RCA diadakan pada 14 September 2012 di Vienna, Austria. Persidangan ini merangkumi perbincangan dua hala Malaysia-IAEA berkaitan isu-isu polisi, pengurusan, pengoperasian dan prosedur RCA di peringkat serantau dan kebangsaan. Malaysia, sebagai negara peneraju bagi projek serantau *"Supporting Radiation Processing of Polymeric Materials for Agricultural Applications and Environmental Remediation"* telah membentangkan kertas kerja tahap kemajuan projek pada persidangan tersebut.

13.1.4 Mesyuarat Peringkat Menteri FNCA ke-13

Mesyuarat Peringkat Menteri bagi FNCA ke-13 telah diadakan di Jakarta, Indonesia pada 23 dan 24 November 2012 dengan kerjasama Pejabat Kabinet (CAO) Jepun dan Badan Tenaga Nuklear Nasional (BATAN), Indonesia. Delegasi Malaysia telah diketuai oleh Y.B. Datuk Seri Dr. Maximus J. Ongkili, Menteri Sains, Teknologi dan Inovasi. Malaysia mencadangkan supaya negara anggota mewujudkan kajian impak teknologi nuklear kepada ekonomi. Program penyebaran maklumat awam (PI/PA) juga dicadangkan bagi mengembangkan peranan teknologi nuklear untuk tujuan keamanan. Kedua-dua cadangan telah diterima baik oleh semua perwakilan.

13.1.2 The 34 th RCA National Representatives Meeting

The 34 th RCA National Representatives Meeting was held on 17-20 April 2012 in Beijing, Republic of China. The meeting discussed the current development of RCA for cycle 2011-2012 and roadmap for the next cycle 2014-2015. This was followed by the 5 th signing of the RCA agreement for cycle 2012-2017 on 8 th June 2012.

13.1.3 RCA General Conference Meeting (RCA GCM)

RCA General Conference Meeting (RCA GCM) was successfully held on 14 September 2012 in Vienna, Austria. The conference covered bilateral discussion between Malaysia-IAEA on policy, management, operational and procedural issues of RCA at regional and national level. Malaysia is the Lead Country for regional project "Supporting Radiation Processing of Polymeric Materials for Agricultural Applications and Environmental Remediation" presented the progress report of the project during the conference.

13.1.4 The 13th FNCA Ministerial Level Meeting

The 13th FNCA Ministerial Level Meeting was held in Jakarta, Indonesia on 23 and 24 November 2012 with the cooperation of Japan Cabinet Office (CAO) and Badan Tenaga Nuklear Nasional (BATAN), Indonesia. Y.B. Datuk Seri Dr. Maximus J. Ongkili, Minister of Science, Technology and Innovation led the Malaysian delegation. Malaysia's proposal for member countries to conduct economic impact studies of nuclear technology and enhance public awareness program on the role of nuclear technology for peaceful uses was well received by the delegates.

Foto 13.2: Ketua Perwakilan dari negara anggota FNCA: Australia, Bangladesh, China, Filipina, Indonesia, Jepun, Kazakhstan, Malaysia, Mongolia, Republik Korea, Thailand dan Vietnam

Photo 13.2: Head Delegations from FNCA Member States: Australia, Bangladesh, China, Indonesia, Japan, Kazakhstan, Malaysia, Mongolia, The Philippines Republic of Korea, Thailand and Vietnam

13.1.5 *Nuclear Security Summit (NSS)* : Seoul, Republik Korea

Sebanyak 53 negara telah menghadiri NSS dengan diwakili oleh Presiden, Perdana Menteri, Timbalan Presiden dan Timbalan Perdana Menteri. YAB Timbalan Perdana Menteri Malaysia dalam ucapannya telah menekankan kepentingan memperkasakan tindakan global dan nasional bagi mempertingkatkan keselamatan, sekuriti dan kawalseliaan bahan-bahan nuklear. Beliau juga menyentuh tentang perhatian kerajaan Malaysia terhadap pengunaan tenaga nuklear dalam penjanaan elektrik.

13.1.5 Nuclear Security Summit (NSS) : Seoul, Republic of Korea

53 countries have attended the NSS represented by Presidents, Prime Ministers, Deputy Presidents and Deputy Prime Ministers. Malaysia's Deputy Prime Minister in his speech has stressed the importance of global and national commitments to increase safety, security and safeguards of nuclear materials. He also mentioned the use of nuclear energy to generate electricity.

Foto 13.3: Delegasi Malaysia ke sidang Kemuncak Keselamatan Nuklear di Seoul Korea Selatan yang diketuai oleh Timbalan Perdana Menteri, YAB Tan Sri Dato' Muhyiddin bin Hj. Mohd Yassin.

Photo 13.3: Malaysian delegation to the Nuclear Security Summit in Seoul, Republic of Korea led by Malaysia's Deputy Prime Minister, YAB Tan Sri Dato' Muhyiddin bin Hj. Mohd Yassin.

13.1.6 Konferen Nuklear Rantau Pasifik ke-18 (PNBC 2012), Busan, Republik Korea

Konferen Nuklear Rantau Pasifik ke-18 (PNBC 2012) yang merangkumi isu polisi nuklear, rekabentuk & jenis reaktor, kitaran bahan api, analisa keselamatan nuklear, pengurusan kemalangan nuklear, pengurusan sisa dan sumber manusia telah diadakan pada 18-22 Mac 2012 di BEXCO, Busan, Republik Korea.

13.1.6 18 th Pacific Basin Nuclear Conference (PNBC 2012), Busan, Republic of Korea

The 18 th Pacific Basin Nuclear Conference (PNBC 2012) discussing the nuclear policy issues, reactor type & design, nuclear fuel cycle, nuclear safety, nuclear accident, waste management and human resource was held on 18-22 March 2012 at BEXCO, Busan, Republic of Korea.

Foto 13.4(a): Ketua Pengarah bersama peserta persidangan
Photo 13.4(a): Director General with conference participants

Foto 13.4(b): Lawatan Ketua Pengarah ke KEPCO International Nuclear Graduate School (KINGS) dimana dua orang pegawai Nuklear Malaysia sedang menuntut.
Photo 13.4(b): Director General visits to KEPCO International Nuclear Graduate School (KINGS) which dua Nuclear Malaysia Officers studied.

13.1.7 Bengkel, Seminar dan Latihan Antarabangsa

Pada tahun 2012, aktiviti kerjasama telah dilaksanakan termasuk menyelaraskan 7 projek kerjasama teknik TC-IAEA kebangsaan, 36 projek TC-IAEA serantau, 2 projek interregional IAEA, 20 projek RCA dan 10 projek FNCA. Tujuh bengkel dan latihan serantau telah diadakan, melibatkan 186 peserta antarabangsa. Seramai 7 peserta juga telah mengikuti program fellowship dan lawatan saintifik di Nuklear Malaysia.

13.1.7 Workshop, Seminar and International Training

In 2012, technical cooperation activities have been implemented including 7 projects under national TC-IAEA, 36 projects regional TC-IAEA, 2 projects inter regional, 20 projects under RCA and 10 projects under FNCA. Seven regional workshops and training courses were held, involving 186 participants. A total of 7 participants attended the fellowship and scientific visit programmes in Nuclear Malaysia.

Foto 13. 5: Nuklear Malaysia dan IAEA menganjurkan bengkel serantau bagi Assessment of Occupational Protection Due to Intake of Radionuclides, 15-18 October 2012 di Nuklear Malaysia.

Photo 13.5: Nuclear Malaysia and the IAEA jointly organized a regional workshop on Assessment of Occupational Protection Due to Intake of Radionuclides, 15-18 October 2012 in Nuclear Malaysia.

Jadual 13.1 : Senarai Projek IAEA-TC Kebangsaan Kitaran 2012-2013
Table 13.1 : IAEA-TC National Projects Cycle 2012-2013

Bil *No*	**Kod Projek** *Project Code*	**Tajuk Projek** *Project Title*	**Ketua Projek** *Project Counterpart*	**Bahagian / Agensi** *Division / Agency*
1.	MAL/1/010	Pembangunan Proses dan Bahan Hijau Menggunakan Sinaran Mengion serta Bahan Nano bagi Pemulihan Alam Sekitar *Development of Green Materials and Process Using Ionising Radiation And Nanomaterials For Environmental Remediation*	Dr Jamaliah Bt. Sharif	BTS
2.	MAL/5/029	Penggunaan Pembiakan Mutasi dan Pengoptimuman Tanah, Nutrien, dan Pengurusan Air bagi Peningkatan Produktiviti Beras untuk Kelestarian Pengeluaran *Application of Mutation Breeding and Optimized soil, Nutrient and Water Management Practices for Enhancement of Rice Productivity for Sustainable Production*	Dr Rusli Ibrahim	BAB
3.	MAL/0/015	Pembangunan Pangkalan Data Biodiversiti dan Radiologi Kebangsaan di Kemudahan Nuklear *Establishment of National Database on Biodiversity and Radiology at the Vicinity of a Nuclear Facility*	Dr Khairuddin Abdul Rahim	BAB
4.	MAL/9/013	Penilaian Kesesuaian Tapak bagi Pelupusan Sisa Aras Rendah dan Disused Sealed Radioactive Source (DSRS) *Suitability Assessment of Candidate Sites for Disposal of Low Level Waste and Disused Sealed Radioactive Source (DSRS).*	Dr Mohd Wahab Yusof	BAS
5.	MAL/2/005	Perancangan Pelaksanaan Program Kuasa Nuklear *Nuclear Power Programme Implementation Planning*	Julia Abdul Karim	BKN
6.	MAL/9/014	Memperkukuhkan Keupayaan Penguatkuasaan Perundangan dari Aspek Keselamatan, Sekuriti dan Kawalselia ke arah Pembangunan Program Kuasa Nuklear di Malaysia *Strengthening the Regulatory Authorities Capabilities in Ensuring Safety, Security and Safeguard Aspects towards the Development of Nuclear Power Programme in Malaysia*	Mohd Pauzi Mohd Sobari	AELB
7.	MAL/1/011	Pembangunan Pengurusan Data Kecekapan Ujian Tanpa Musnah (NDT) melalui Modaliti Menyeluruh NDT *Development of efficient NDT data management through integrated NDT modalities*	Siti Madiha Muhammad Amir	BTI
8.	MAL/6/020	*Strengthening Cancer Services Throughout The Country.*	Dr Gerard Chin Chye Lim	HKL

Jadual 13.2 : Senarai Pelatih Dan Pelawat Saintifik Yang Menjalani Latihan Di Nuklear Malaysia
Table 13.2 : Fellows and Sceintific Visitors Trained in Nuclear Malaysia

Bil. *No.*	**Nama** *Name*	**Pelatih/Pelawat Saintifik** *Fellows and Sceintific Visitors*	**Negara** *Country*	**Tarikh** *Date*	**Penyelia** *Supervisor*
1.	Zakiya Salem Mohammed Al-Rahbi	*Scientific Visit*	Oman	19-23 Mac 2012	Mr. Taiman Kadni (SSDL)
2.	Khalsa Al-Shukaili	*Scientific Visit*	Oman		
3.	Majed M.A. Al-Bokari	*Scientific Visit*	Saudi Arabia	26-30 Mac 2012	Dr. Khairuddin Abd Rahim (BAB)
4.	Saad Alzahrani	*Scientific Visit*	Saudi Arabia		
5.	Minh Quynh Tran	*Fellowship*	Vietnam	2 May-31 July 2012	Dr.Kamarudin Hashim (BTS)
6.	Bang Diep Tran	*Fellowship*	Vietnam		
7.	Mudiyanselage Tennakoon	*Scientific Visit*	Sri Lanka	29 Okt – 9 Nov 2012	Dr. Abdul Nassir Ibrahim (BTI),

Jadual 13.3: Bengkel dan Latihan Serantau yang dianjurkan oleh Nuklear Malaysia
Table 13.3: Regional Workshops and Training Courses organized by Nuclear Malaysia

Bil. *No.*	**Aktiviti** *Activity*	**Tarikh** *Date*
1	Latihan Serantau IAEA bagi Model Modal Insan Kuasa Nuklear (NPHR) *IAEA Training Course on Nuclear Power Human Resource (NPHR) Modelling Tool*	23 – 27 Apr 2012 *23 – 27 Apr 2012*
2	Latihan Serantau Teknik Radiografi Digital bagi Personel Yang Dipersijilkan dalam Radiografi Aras 2. *Regional Training Course on Digital Industrial Radiography Technique For Personnel Already Certified in Radiography Level 2*	4 – 8 Jun 2012 *4 – 8 June 2012*
3	Mesyuarat Penyelarasan Serantau Pertama bagi Meningkatkan Produktiviti Tanaman Tempatan melalui Penyebaran Germplasma Mutasi dan Penilaian Tanah, Nutrisi dan Pengurusan Air. *First Regional Coordination Meeting on Enhancing Productivity of Locally-underused Crops through Dissemination of Mutated Germplasm and Evaluation of Soil, Nutrient and Water Management Practices*	18 – 22 Jun 2012 *18 – 22 June 2012*
4	Mesyuarat Penyelarasan Serantau bagi Menyokong Kelestarian Pemonitoran Pencemaran Udara menggunakan Teknik Analisis Nuklear (RAS/7/023). *Regional Coordination Meeting on Supporting Sustainable Air Pollution Monitoring Using Nuclear Analytical Technology (RAS/7/023).*	9 – 13 Jul 2012 *9 – 13 July 2012*
5	Bengkel Serantau IAEA bagi Pendedahan Pekerjaan berkaitan Pengambilan Radionuklid (RAS/9/064) *IAEA Regional Workshop on Occupational Exposures (ORP) due to Intake of Radionuclides (RAS/9/064)*	15 – 19 Oct 2012 *15 – 19 Oct 2012*
6	Mesyuarat Semakan Pertengahan Penggal IAEA/RCA bagi projek RAS/6/053: Menambahbaik Imej Berdasarkan Terapi Sinaran bagi Kanser-Kanser di Rantau RCA. *IAEA/RCA Mid-term Project Review Meeting for RAS/6/053: Improving Image Based Radiation Therapy for Common Cancers in the RCA Region.*	26 – 29 Nov 2012 *26 – 29 Nov 2012*
7	Persidangan Antarabangsa Pembangunan Modal Insan di Asia & Pasifik *International Conference on Nuclear Human Resource Development in Asia & Pacific*	19-21 Nov 2012 *19-21 Nov 2012*

13.2 Kerjasama Dua Hala

Penerokaan kerjasama dengan pelbagai negara untuk membangunkan teknologi nuklear terus diperkukuhkan. Pada tahun 2012, beberapa mesyuarat, seminar dan lawatan teknikal bagi mengenalpasti bidang utama kerjasama telah diadakan dengan delegasi dari Amerika Syarikat, Argentina, Brazil, India, Jepun, Kanada, Perancis, Persekutuan Russia dan Romania. Nuklear Malaysia juga telah mengelolakan lima seminar dan sepuluh lawatan saintifik. Nuklear Malaysia juga telah menyediakan sebanyak 37 Maklumat Ikhtisar dan Nota Percakapan kepada MOSTI berkaitan peluang kerjasama sains dan teknologi nuklear.

13.2 Bilateral Cooperation

In addition,Nuclear Malaysia has established bilateral collaborative ventures with other countries. Several meetings, seminars and technical visits to identify the main areas of cooperation have been held with delegations from the United States, Argentina, Brazil, India, Japan, Canada, France, Russia Federation and Romania. Nuclear Malaysia has successfully organized lima seminars and sepuluh scientific visits. Nuclear Malaysia has also provided a total of 37 Abstracts of Information and Speech Notes to MOSTI, in relation to the collaborations in nuclear science and technology.

Foto 13.6: Nuklear Malaysia dengan kerjasama Wakasa Wan Energy Research Centre (WERC) menganjurkan Seminar on Sharing Experience on Nuclear Power in Malaysia pada 26-30 Mac 2012.
Photo 13.6: Nuclear Malaysia in collaboration with Wakasa Wan Energy Research Center (WERC) organized a Seminar on Sharing Experience on Nuclear Power in Malaysia, 26 -30 March 2012, Nuclear Malaysia

Foto 13.7: Seminar di antara Nuklear Malaysia dengan Comprehensive Nuclear Test-Ban Treaty and Disarmament, Australian Safeguards and Non-Proliferation Office, Department of Foreign Affairs and Trade, Australia , 4 Jun 2012, Nuklear Malaysia.
Photo 13.7: Seminar between Nuclear Malaysia and Comprehensive Nuclear Test-Ban Treaty and Disarmament, Australian Safeguards and Non-Proliferation Office, Department of Foreign Affairs and Trade, Australia , 4 June 2012, Nuclear Malaysia.

Foto 13.8: Mesyuarat Nuklear Malaysia dengan delegasi Tokyo Institute of Technology (TIT), Jepun pada 7 September 2012.
Photo 13.8: Meeting between Nuclear Malaysia and delegates of Tokyo Institute of Technology (TIT), 7 September 2012.

Jadual 13.4 : Seminar Duahala Antarabangsa
Table 13.4 : International Bilateral Seminar

BIL *No*	**Tarikh** *Date*	**Tajuk Seminar** *Seminar Title*
1.	13-14 Februari 2012 *13-14 February 2012*	Kerjasama Seminar Sains UK-Malaysia di dalam Nuklear Awam dan Mesyuarat Bersama Delegasi UK *UK-Malaysia Partners in Science Seminar on Civilian Nuclear And Meeting With UK Delegates*
2.	26-30 Mac 2012 *26-30 March 2012*	Seminar Perkongsian Pengalaman di dalam Kuasa Nuklear di Malaysia, Nuklear Malaysia- Wakasa Wan Energy Research Centre (WERC) *Seminar of sharing experience on nuclear power in Malaysia, Nuclear Malaysia- Wakasa Wan Energy Research Centre (WERC)*
3.	19 April 2012 *19 April 2012*	Pembentangan Teknikal SMART Reactor, Nuclear Malaysia-Korea Atomic Energy Research Institute (KAERI) *Technical Presentation on SMART Reactor Nuclear Malaysia-Korea Atomic Energy Research Institute (KAERI)*
4.	3 Mei 2012 *3 May 2012*	Simposium duahala Small Medium-Sized Reactor (SMR) oleh NuScale Power, USA *Bilateral Symposia On Small Medium-Sized Reactor (SMR) by NuScale Power, USA*
5.	4 Jun 2012 *4 June 2012*	Seminar Triti Pengharaman Menyeluruh Ujian Senjata Nuklear (CTBT) : Pelaksanaan dan Penggunaan oleh Comprehensive Nuclear Test-Ban Treaty and Disarmament, Australian Safeguards and Non-Proliferation Office, Department of Foreign Affairs and Trade, Australia. *The Comprehensive NuclearTest-Ban Treaty (CTBT): The Implementation and Application Seminar by Comprehensive Nuclear Test-Ban Treaty and Disarmament, Australian Safeguards and Non-Proliferation Office, Department of Foreign Affairs and Trade, Australia.*

Jadual 13.5 : Lawatan Saintifik Dua Hala Antarabangsa
Table 13.5 : International Bilateral Scientific Visit

BIL *No.*	TARIKH *DATE*	NEGARA /AGENSI BERKAITAN *COUNTRY/ AGENCY*	PELAWAT SAINTIFIK *SCIENTIFIC VISITOR*
1.	16 April 2012	United States Nuclear Regulatory Commission (USNRC), United States of America	i. Ms.Danielle Emche, International Relation Specialist, USNRC
2.	19 April 2012	Korea Atomic Energy Research Institute (KAERI)	i. Dr. Jae Joo Ha Vice President Advanced Reactor Development Korea Atomic Energy Research Institute (KAERI) ii. Dr. Keung Koo Kim Director SMART Development Project Management Division Korea Atomic Energy Research Institute (KAERI)
3.	3 May 2012	NuScale Power, USA	i. Dr. Corey McDaniel, Director of International Business Development, NuScale Power, USA
4.	4 June 2012	Australia Programme Management	i. Mr.Malcom Coxhead, Australian Safeguard and Non-proliferation Office ii. Mr. David Jepsen, Geoscience Australia iii. Mr. Martin Mcgavin, Geoscience Australia
5.	25-29 June 2012	Officer (PMO) for Malaysia, Asia and the Pacific Division, Technical Cooperation Department ,IAEA	i. Mr Gashaw Wolde
6.	6 Sept 2012	Integrated Support Center for Nuclear Nonproliferation and Nuclear Security (ISCN), Japan Atomic Energy Agency (JAEA), Japan	i. Mr. Michiaki OHKUBO, Supreme Researcher & Deputy Director, ISCN ii. Ms. Kazuko HAMADA, Senior Post-Doctoral Fellow, ISCN iii. Ms. Yuka USUI, Seminar Coordinator, ISCN
7.	7 Sept 2012	Tokyo Institute of Technology (TIT), Japan	i. Prof. Masaki Saito
8.	24-26 Sept 2012	Director of Asia and the Pacific Division, Technical Cooperation Department, IAEA	i. Mr Ali Boussaha

Jadual 13.5 : Lawatan Saintifik Dua Hala Antarabangsa
Table 13.5 : International Bilateral Scientific Visit

BIL *No.*	TARIKH *DATE*	NEGARA /AGENSI BERKAITAN *COUNTRY/ AGENCY*	PELAWAT SAINTIFIK *SCIENTIFIC VISITOR*
9.	*5-9 Nov 2012*	*Mongolia*	*i. G.Manlaijav, Head, Nuclear Innovative Technology Department, Nuclear Energy Agency* *ii. O.Tsendsuren, Officer in charge of mineral resources and energy, National Safety Council* *iii. G.Turmunkh State Senior Inspector, Nuclear and Radiation Regulatory Authority, Nuclear Energy Agency* *iv. A.Undrakhbayar, Senior press officer, International Cooperation Department, Nuclear Energy Agency* *v. Ts.Otgontsetseg, Officer, Nuclear Innovative Technology Department, Nuclear Energy Agency* *vi. M.Chadraabal, Officer, Nuclear Innovative Technology Department, Nuclear Energy Agency* *vii. D.Ganbaatar, Officer, Legal Department, Nuclear Energy Agency* *viii. B.Mendbayar, Officer, Physics and Technology Institute, Mongolian Academy of Science* *ix. N.Norov, Doctor, Nuclear physics and technology sector, Nuclear Research Center, National University of Mongolia* *x. O.Lkhagva, Academician, National University of Mongolia* *xi. Kh.Tsookhuu,Academician, National University of Mongolia* *xii. Kh.Tuvshintugs, Journalist "Undesnii shuudan" newspaper* *xiii. G.Delgertsetseg, News-writer "Udriin" newspaper* *xiv. T.Tsogt-Erdene, Journalist "Udriin" newspaper*
10.	*12 Nov 2012*	*Korea Atomic Energy Enterprise Association (KAEEA), Republic of Korea*	*i. Mr. Hwa Sup Kim, Chairman KAEEA* *ii. Dr. Poong Eil Juhn, Senior Vice Chairman KAEEA*

14. Pengurusan Maklumat & Komunikasi Korporat

14. Information Management & Corporate Communication

14.1 Pengurusan Maklumat

Nuklear Malaysia mempunyai aset pengetahuan yang bersifat kompleks dan unik. Ini berasaskan sifat pengetahuan nuklear itu sendiri yang luas dan merentasi pelbagai disiplin seperti fizik, sains, kejuruteraan, ekonomi, undang-undang dan penerimaan awam. Nuklear Malaysia telah mengambil inisiatif untuk melindungi aset ini melalui pemantapan pengurusan pengetahuan (KM). Teknologi ini juga memerlukan kepakaran tinggi dan memerlukan tempoh matang yang lama. Maklumat berkaitan juga perlu dijaga dengan sebaiknya kerana melibatkan isu-isu sensitif seperti kerjasama antarabangsa dan keselamatan negara.

Berdasarkan insiatif ini, Polisi Pengurusan Pengetahuan Nuklear Malaysia telah dibangunkan. Pembangunan polisi ini adalah selaras dengan resolusi yang dipersetujui pada Persidangan ahunan Agensi Tenaga Atom Antarabangsa (IAEA) 2002 yang menggesa setiap negara ahli memberi keutamaan tinggi kepada pengurusan pengetahuan nuklear. Di Malaysia, pelaksanaan KM juga adalah antara elemen penting dalam menjayakan Dasar Sains dan Teknologi Negara Kedua (DSTN2) iaitu melalui penyediaan maklumat yang tepat untuk pembangunan S&T negara.

Polisi KM Nuklear Malaysia meliputi pengurusan keseluruhan sumber atau aset pengetahuan yang dimiliki oleh agensi, sama ada pengetahuan berbentuk tacit, implicit dan explicit. Sumber dan asset pengetahuan ini sedang disimpan, diterima, dicipta, diguna dan dikongsi oleh warga Nuklear Malaysia secara langsung dan tidak langsung dalam semua aktiviti dan operasi harian mereka. Polisi KM Nuklear Malaysia ini mengandungi garis panduan dan prosedur yang perlu dibaca, dipatuhi dan diamal dalam memelihara aset pengetahuan yang dimiliki oleh agensi. Polisi ini juga menerangkan kepada warga Nuklear Malaysia mengenai tanggungjawab dan peranan mereka dalam melindungi aset pengetahuan agensi.

14.1 Information Management

Knowledge assets in Nuclear Malaysia are complex and unique. This is based upon the characteristics of the nuclear knowledge which are vast and cut across a range of disciplines such as physics, science, engineering, economics, law and public acceptance. Nuclear Malaysia has taken the initiative to protect these assets through enhancement of knowledge management (KM). This technology needs high expertise and requires a long gestation period to reach maturity. Relevant information should also be taken care of because it involves sensitive issues such as international cooperation and national security.

Based on this initiative, Nuclear Malaysia Knowledge Management Policy was developed. The policy is in line with the resolution adopted at the Annual Conference of the International Atomic Energy Agency (IAEA) in 2002 which urged all member states to give high priority to nuclear knowledge management. In Malaysia KM implementation is also one of the important elements in the success of the National Science and Technology Policy II (DSTN2), through the provision of accurate information to the development of S & T.

Nuclear Malaysia KM Policy covers the management of knowledge resources or assets owned by the agency, whether tacit, implicit or explicit knowledge. Resources and knowledge assets are being stored, received, created, used and shared by all Nuclear Malaysia members directly and indirectly in their daily activities and operations. Nuclear Malaysia KM Policy contains guidelines and procedures that should be read, adhered to and practiced in keeping the knowledge assets owned by the agency. The policy also describes the role and responsibility of every member of Nuclear Malaysia in protecting knowledge asset.

Objektif Polisi KM Nuklear Malaysia adalah;

a) Mengumpul dan memelihara pengetahuan kritikal dari risiko kehilangan (knowledge loss) atau jatuh ke tangan pihak yang tidak bertanggungjawab.

b) Memastikan aset pengetahuanuklear Malaysia dipelihara dalam keadaan baik untuk rujukan pada masa sekarang dan masa hadapan.

c) Membangunkan keupayaan dan kepakaran modal insan agar Nuklear Malaysia dan Negara sentiasa bersedia untuk menyokong program aplikasi teknologi nuklear dalam pelbagai bidang termasuk tenaga nuklear untuk kepentingan sosio ekonomi.

d) Memupuk budaya pengurusan pengetahuan yang baik.

e) Menggalakkan pembangunan teknologi dan inovasi dalam bidang nuklear tempatan melalui pengurusan pengetahuan yang berkesan.

Polisi KM Nuklear Malaysia dilaksanakan bagi menjamin kelestarian teknologi nuklear negara. Polisi ini turut merangkumi beberapa inisiatif KM untuk membudayakan amalan KM di agensi bagi meningkatkan R&D dan inovasi pengetahuan baru dari semasa ke semasa seperti *Community of Practice (CoP), storytelling,* program perkongsian pengetahuan bersama pakar, *Systematic Approach Training (SAT),* pelan persaraan, *exit interview,* penilaian risiko kehilangan ilmu pengetahuan dan maklumat, portal intranet dan log operasi. Pengarah-pengarah bahagian pula bertanggungjawab untuk memperkenal dan melaksanakan inisiatif-insiatif KM untuk mengekalkan pengetahuan tacit melalui aktiviti *mentoring, coaching* dan *shadowing* untuk pengetahuan kritikal

Nuclear Malaysia KM Policy objectives are;

a) Collecting and preserving critical knowledge from the risk of loss (knowledge loss) or fall into irresponsible hands.

b) Ensuring Nuclear Malaysia knowledge assets are well preserved for current and future reference.

c) Developing the human capital capability and expertise to gear up Nuclear Malaysia and Malaysia to support the application of nuclear technology in various fields including nuclear energy for socio-economic benefit.

d) Fostering a good knowledge management culture.

e) Encouraging the development of local nuclear technology and innovation through effective knowledge management.

Nuclear Malaysia KM policy is implemented to ensure the sustainability of nuclear technology. This policy also covers some KM initiatives to inculcate KM practices in the agency to increase R & D and innovation of new knowledge from time to time such as Community of Practice (CoP), Story Telling, experts knowledge sharing programmes, Systematic Approach Training (SAT), succession planning, exit interviews, knowledge loss risk assessment, intranet Portals and operation logs. Division directors hold the responsibilities to introduce and implement KM initiatives to sustain tacit knowledge through mentoring, coaching and shadowing for critical knowledge.

Foto 14.1: Bengkel *Process Oriented Knowledge Management* (POKM)
Photo 14.2: Process Oriented Knowledge Management (POKM) Workshop

Peranan sebagai pusat rujukan untuk penerbitan IAEA serta pusat INIS kebangsaan terus diperkasakan. Pada tahun 2012 sebanyak 403 input melalui penerbitan saintifik tempatan telah dikemukakan kepada INIS (Rajah 14.1) di mana 150 daripadanya berteks penuh.

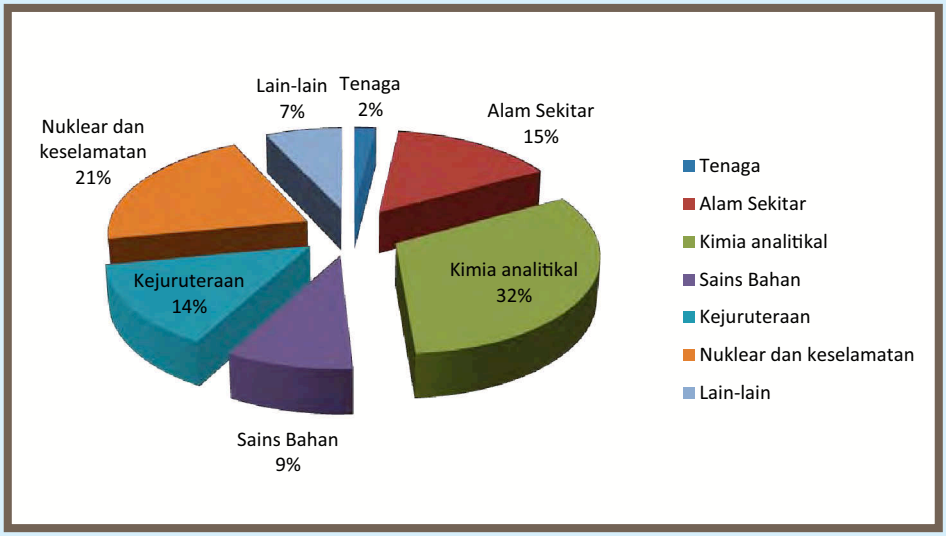
Selain itu, pelbagai aktiviti INIS telah dijalankan untuk memastikan INIS dimanfaatkan oleh pengguna khususnya penyelidik dan pelajar, antaranya seperti pengumpulan penerbitan yang berkaitan dengan nuklear dan teknologi berkaitan, penyebaran maklumat terpilih (SDI), perkhidmatan capaian maklumat nuklear menerusi INIS *Search Collection*, perkhidmatan penghantaran dokumen dan promosi serta demo. Nuklear Malaysia juga telah mengadakan empat program promosi INIS di TNBR, SGI Kedah, UNIMAS, UKM. Nuklear Malaysia juga terus memperkasa Perpustakaan Nuklear Malaysia dengan pelbagai jurnal dan buku rujukan terkini.

The roles of the IAEA reference centre for publications as well as national INIS centre continue to be strengthened. In the year 2012 a total of 403 local inputs through scientific publications submitted to INIS (Figure 14.1).

In addition, INIS activities were conducted to ensure INIS is utilized by researchers and students, such as collection of nuclear-related publications, selective dissemination of information (SDI), nuclear information access services through the INIS Search Collection, services delivery and promotion as well as a demonstration. Four INIS promotion programmes have been conducted at TNBR, SGI Kedah, UNIMAS, and UKM. Nuclear Malaysia continuously strengthens its library with a variety of current journals and reference books.

Jadual 14.1: Bilangan penerbitan yang disumbangkan ke pangkalan data INIS tahun 2012
Table 14.1 : Number of publications contributed to the INIS database in 2012

Jenis penerbitan	***Type of publications***	***Bilangan / Number***
Buku dan bab dalam buku	*Books and Chapters in books*	36
Persidangan	*Conference*	161
Artikel dalam jurnal	*Articles in journal*	184
Laporan	*Report*	4
Tesis	*Thesis*	33



Rajah 14.1: Input INIS Mengikut Subjek
Figure 14.1: INIS Input According to Subject

Penerbitan merupakan salah satu hasil daripada aktiviti teras Nuklear Malaysia. Sejumlah 431 penerbitan saintifik, teknikal dan bukan teknikal turut dikumpulkan dan direkodkan untuk rujukan.

Publication is one of the outputs from Nuclear Malaysia core activities. A total of 431 scientific, technical and non-technical documents have been compiled and recorded for reference.

Jadual 14.2: Penerbitan tahun 2012
Table 14.2: Publications in 2012

Penerbitan	***Publication***	**Bilangan / *Number***
Buku	*Book*	1
Bab Dalam Buku	*Chapter in Book*	3
Tesis (Sarjana & PhD)	*Thesis – Masters & PhD*	13
Jurnal Antarabangsa	*International Journal*	62
Jurnal Kebangsaan	*National Journa*	33
Konferen Antarabangsa	*International Conference*	87
Konferen Kebangsaan	*National Conference*	107
Penerbitan Umum Antarabangsa	*International General Publication*	7
Penerbitan Umum Kebangsaan	*National General Publication*	24
Laporan Teknikal	*Technical Report*	94
Jumlah penerbitan	***Total publication***	**431**

Nuklear Malaysia juga komited dalam usaha menggalakkan penulisan dalam kalangan pegawai penyelidik bagi mempertingkatkan perkongsian ilmu, maklumat, teknologi serta kepakaran. Selain daripada penerbitan dalaman, agensi ini juga mengadakan kerjasama strategik dengan Dewan Bahasa dan Pustaka bagi penerbitan bahan ilmiah dan saintifik. Pada tahun 2012, kerjasama dijalin untuk penerbitan Ensiklopedia Sains Nuklear.

Nuclear Malaysia is also committed to promote writing among researchers to improve knowledge sharing, information, technology and expertise. Apart from in-house publication, the agency also conducts strategic partnership with Dewan Bahasa dan Pustaka for publishing scholarly and scientific materials. In 2012, an agreement was made for the publication of Nuclear Science Encyclopaedia.

Foto 14.2 :Taklimat Penulisan Ensiklopedia Sains Nuklear, Nuklear Malaysia – DBP
Photo 14.2 : Briefing on Nuclear Science Encyclopaedia, Nuclear Malaysia - DBP

Foto 14.3 : Program Kesedaran dan Penerimaan Awam Teknologi Nuklear Peringkat Sekolah.
Photo 14.3 : Nuclear Technology Awareness and Public Acceptance Programme in School.

Berdasarkan pengalaman dan senario global ternyata sokongan masyarakat awam sangat penting dalam menentukan kejayaaan program teknologi nuklear. Sebanyak 43 ceramah di sekolah dan 25 pameran telah diadakan di seluruh negara. Maklumat juga disebarkan melalui laman sesawang dan edaran risalah.

Based on experience and global scenario, society's support is vital in determining the success of nuclear technology programme. A series of talk to 43 schools and 25 exhibitions were held throughout the country. Information is also disseminated through the website and pamphlets.

14.2 Komunikasi Korporat

14.2.1 Peningkatan Imej Organisasi

Sepanjang tahun 2012, Nuklear Malaysia telah melaksanakan pelbagai aktiviti bagi peningkatan imej organisasi. Program ini melibatkan lawatan ke Nuklear Malaysia, ceramah, penerbitan risalah untuk edaran umum, pameran dan publisiti melalui media cetak dan elektronik. Aktiviti ini bertujuan mempromosi hasil penyelidikan dan erkhidmatan yang ditawarkan oleh agensi dan meningkatkan kesedaran serta penerimaan awam terhadap teknologi nuklear.

14.2 Corporate Communication

14.2.1 Organisational Image Enhancement

Throughout 2012, Nuclear Malaysia undertook various programmes for image enhancement of organization. These activities included visits to Nuclear Malaysia, technical lectures on nuclear technology application, publication and distributions of brochures, participation in exhibition and publicity through print and electronic media. The objectives of the programmes are to promote research products and services and to enhance public awareness and acceptance for nuclear technology.

Jadual 14.3 : Aktiviti Promosi Sains Dan Teknologi Nuklear
Table 14.3 : Image Enhancement Activities in 2012

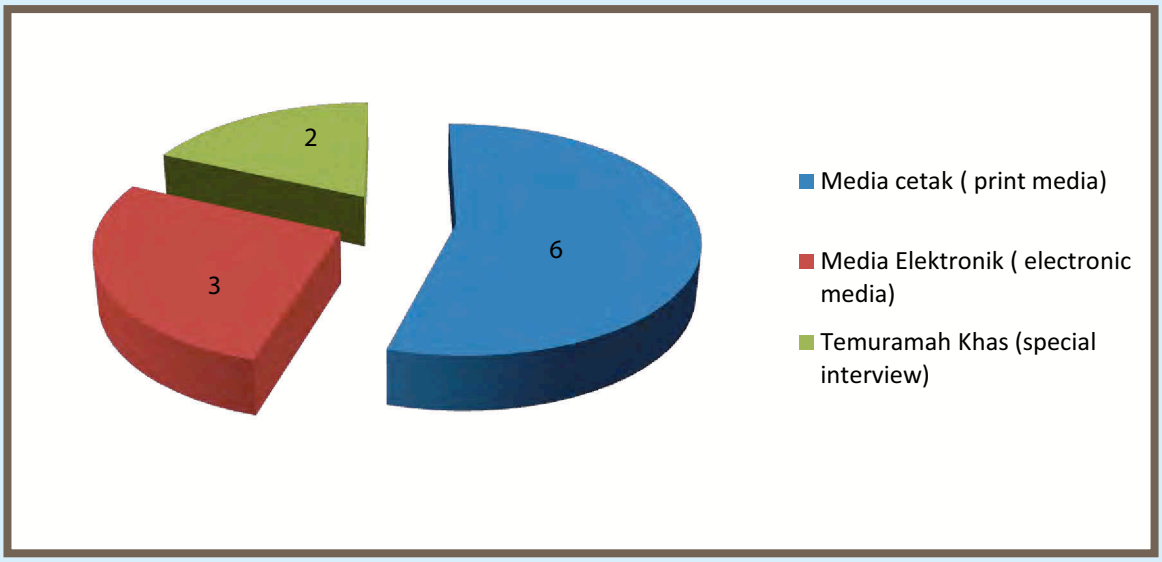
Aktiviti ***Activitities***	**Bil. Aktiviti** ***Number of Activities***
Lawatan ke Nuklear Malaysia *Visits to Nuclear Malaysia*	6,098 pelawat (85 lawatan) *6,098 visitors (85 visits)*
Ceramah Kesedaran dan Penerimaan Awam *Lectures on Public Awareness and Acceptance*	43 sekolah *43 schools*
Penerbitan risalah untuk edaran umum *Publication of brochures for public distribution*	30,550 risalah *30,550 brochures*
Pameran teknologi nuklear *Nuclear Technology Exhibition*	25 pameran *25 exhibitions*
Liputan akhbar *Newspaper Coverage*	6 liputan *6 coverage*

14.2.2 Liputan Media

Liputan media memainkan peranan penting dalam mempromosi sesebuah organisasi. Selain mendedahkan masyarakat Malaysia dan antarabangsa kepada fungsi, peranan dan perkembangan di Nuklear Malaysia, liputan media juga membantu untuk menaikkan nama Nuklear Malaysia. Sepanjang tahun 2012, sebanyak 11 liputan media telah diadakan di mana enam daripadanya ialah media cetak, tiga media elektronik dan dua temuramah khas.

14.2.2 Media Coverage

Media coverage plays an important role in the promotion of an organization. Besides exposing the public and the international society to the functions, roles and developments of Nuclear Malaysia, media coverage also helps boost the image of Nuclear Malaysia. Throughout 2012, a total of 11 media coverage had been done, six of them being print media, three TV programmes, and two special interviews.



Rajah 14.2 : Liputan media sepanjang tahun 2012
Figure 14.2 : Media coverage throughout 2012.

Jadual 14.4 : Liputan media cetak tahun 2012
Table 14.4 : Print media coverage in 2012.

(a) SENARAI LIPUTAN MEDIA CETAK SEHINGGA DISEMBER 2012
(a) (b)LIST OF PRINT MEDIA COVERAGE UNTIL DECEMBER 2012

BIL No	PROGRAM *PROGRAMME*	MEDIA *MEDIA*	TARIKH *DATE*
1	SEMINAR TENAGA NUKLEAR TAJUK :PENGGUNAAN TENAGA NUKLEAR : ADAKAH MALAYSIA BERSEDIA DARI SEGI KESELAMATAN *NUCLEAR ENERGY SEMINAR* *TITLE : NUCLEAR ENERGY APLICATION : IS MALAYSIA READY FROM SAFETY ASPECT*	BERITA HARIAN	18.03.2012
2	RENCANA : MISTERI BATU BERSURAT TERUNGKAI *DOCUMENTARY : MYSTERY OF "BATU BERSURAT" REVEALED*	BERITA HARIAN	29.03.2012
3.	*SYMPOSIUM OF RARE EARTHS*	SIN CHEW DAILY, NEW STRAITS TIME	08.05.2012
4	*INTELLECTUAL PROPERTY SHOWCASE*	UTUSAN MALAYSIA	10.05.2012
5	*RADIATION PROTECTION CONFERENCE & WORKSHOP 2012*	HARIAN METRO	06.06.2012
6	HARI INOVASI DAN SAMBUTAN 40 TAHUN PENUBUHAN AGENSI NUKLEAR MALAYSIA	BERNAMA, UTUSAN MALAYSIA, NEW STRAITS TIME, ORIENTAL DAILY NEWS	03.07.2012

(b) SENARAI LIPUTAN MEDIA ELEKTRONIK SEHINGGA DISEMBER 2012
(b) LIST OF ELECTRONIC MEDIA COVERAGE UNTIL DECEMBER 2012

BIL *NO*	TAJUK *TITLE*	TARIKH *DATE*	MEDIA *MEDIA*
1	40 TAHUN AGENSI NUKLEAR MALAYSIA *40 YEARS MALAYSIAN NUCLEAR AGENCY*	8 MEI 2012	SELAMAT PAGI 1MALAYSIA
2	FIRST INTERNATIONAL SYMPOSIUM 'RARE EARTH'	10 MEI 2012	BERNAMA RADIO
3	HARI INOVASI NUKLEAR MALAYSIA *NUCLEAR MALAYSIA INNOVATION DAY*	28 JUN 2012	HELLO ON TWO (RTM)

(c) SENARAI TEMURAMAH KHAS MEDIA SEHINGGA DISEMBER 2012
(c) LIST OF SPECIAL INTERVIEW UNTIL DECEMBER 2012

BIL *NO*	PERKARA *ITEM*	TARIKH *DATE*	MEDIA *MEDIA*
1	SIDANG MEDIA SEMPENA PROGRAM RADIATION PROTECTION CONFERENCE & WORKSHOP 2012 DI PULAU PINANG *PRESS CONFERENCE IN CONJUNCTION WITH RADIATION PROTECTION CONFERENCE PROGRAMME & WORKSHOP 2012 AT PULAU PINANG*	5 JUN 2012	BERNAMA, RTM, UTUSAN MALAYSIA
2	MAJLIS MENANDATANGANI MOU DI ANTARA NUKLEAR MALAYSIA DAN NCSM *MOU SIGNING CEREMONY BETWEEN MALAYSIA NUKLEAR AND NCSM*	12 SEPT 2012	THE MALAY MAIL, RTM, NST, THE SUN, SIN CHEW DAILY, UTUSAN, HARIAN METRO

Foto 14.4 : Program Selamat Pagi 1Malaysia Bersama Ketua Pengarah
Photo 14.4 : Selamat Pagi 1Malaysia Programme with Diretor General

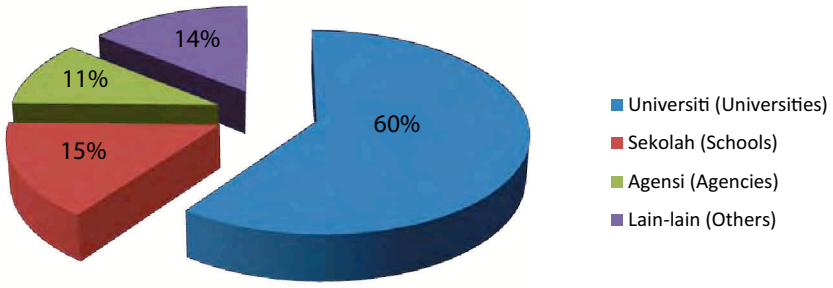
Foto 14.5 : Program *Hello On Two* bersama Dr. Wan Manshol bin Wan Zain.
Photo 14.5 : Hello on Two programme with Dr. Wan Manshol bi Wan Zain

14.2.3 Program Promosi

Bagi memperkenalkan fungsi, peranan, dan kemudahan di Nuklear Malaysia kepada dunia luar, aktiviti promosi dijalankan melalui penerimaan pelawat sepanjang tahun. Bagi tahun 2012, seramai 6,098 pelawat telah melawat melibatkan 85 rombongan ke Nuklear Malaysia. Lawatan yang diterima adalah daripada sekolah-sekolah, universiti, institut penyelidikan dan lain-lain. Kategori pelawat ditunjukkan pada Rajah 14.3.

14.2.3 Promotional Programmes

As a means to introduce functions and roles of Nuclear Malaysia as well as its facilities, promotional activities to the public were arranged throughout the year. In 2012, Nuclear Malaysia received a total of 6,098 visitors involving 85 groups from schools, universities, research institutes and others. Categories of visitors are shown in Figure 14.3.



Rajah 14.3: Kategori pelawat pada tahun 2012
Figure 14.3: Categories of visitors in 2012.

Foto 14.6 : Lawatan UiTM Kuala Pilah
Photo 14.6 : Visit by UiTM Kuala Pilah

Foto 14.7 : Lawatan Maktab Turus Angkatan Tentera
Photo 14.7 : Visit by Military Staff College

Foto 14.8 : Lawatan TLDM, Lumut.
Photo 14.8 : Visit by TLDM, Lumut

Foto 14.9 : Lawatan peserta International Conference On Nuclear Humn Resource Development In Asia and Pacific
Photo 14.9 : Visits from International Conference On Nuclear Human Resource Development In Asia and Pacific participants.

15. Pembangunan Modal Insan

15. Human Capital Development

15.1 Perancangan Pembangunan Modal Insan

Kecemerlangan Nuklear Malaysia pada hari ini adalah didokong oleh modal insan yang cekap dan dinamik. Nuklear Malaysia kini berhadapan dengan situasi kritikal dengan persaraan wajib sebahagian pegawai yang pakar dalam pelbagai bidang. Bagi menghadapi situasi ini dua program penting telah diberi penekanan khusus iaitu:

- Pembangunan kerjaya dan kompetensi kakitangan.
- Perancangan penggantian modal insan.

15.1.1 Pembangunan Kerjaya dan Kompetensi Kakitangan

Pembangunan kerjaya dan kompetensi kakitangan khususnya aspek kemahiran dan pengetahuan sentiasa dititikberatkan. Usaha ini dicapai melalui peluang latihan di dalam dan di luar negara. Latihan-latihan ini terbahagi kepada kursus jangka panjang, kursus jangka pendek dan latihan kemahiran dalam bidang kerjaya masing-masing.

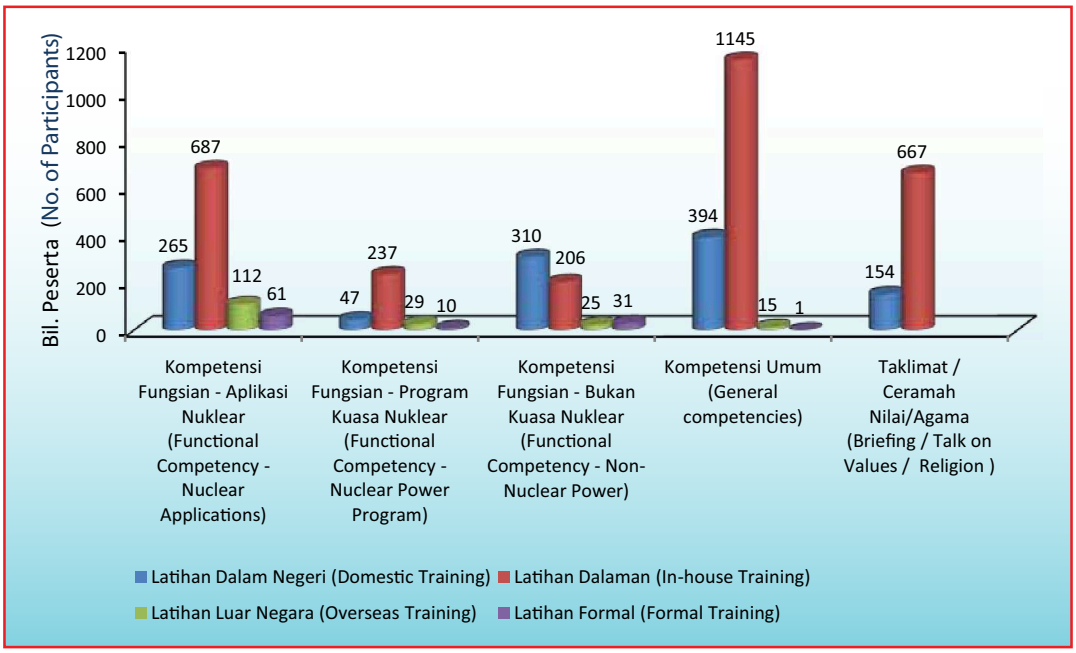
15.1 Planning Of Human Capital Development

The prominence of Nuclear Malaysia was made possible with its efficient and dynamic human resource. Nuclear Malaysia is facing a critical situation with the retirement of its senior staff. Realising the importance of human resource in an institution, two major programmes are given main emphasis namely:

- *Career and competency development of staff.*
- *Human resource succession plan.*

15.1.1 Career and Competency Development of Staff

Career and competency development of staff are based on skills and knowledge. These are accomplished through training held locally and abroad. These trainings are categorised as long-term and short-term training as well as assessment of level of competency and expertise in respective fields.



Rajah 15.1: Bilangan Penyertaan Kakitangan dalam Program Latihan Pembangunan Kerjaya.
Figure 15.1: Number of Staff Participation in Career Development Training Programmes.

Jadual 15.1: Bilangan Penyertaan kakitangan dalam program latihan pembangunan kerjaya
Table 15.1: Number of staff participation in cereer Development Training Programmes

Kompetensi Utama (*Key Competency*)	Latihan Dalam Negeri (*Domestic Training*)	Latihan Dalaman (*In-house Training*)	Latihan Luar Negara (*Overseas Training*)	Latihan Formal (*Formal Training*)
Industri (*Industry*)	100	130	26	31
Keselamatan Dan Kesihatan Sinaran (*Radiation Safety and Health)*	226	400	26	10
Reaktor, Kejuruteraan dan Tenaga Nuklear (*Reactor, Engineering and Nuclear Energy)*	78	338	43	31
Alam Sekitar Dan Sisa Nuklear (*Environment and Nuclear Waste*)	34	55	23	10
Pengurusan Teknologi Nuklear (*Nuclear Technology Management*)	392	924	39	4
Pertanian Dan Bioteknologi (*Agriculture and Biotechnology*)	51	28	15	12
Perubatan Dan Bioteknologi (*Medical and Biotechnology*)	29	87	5	4
Bukan Teknikal/Soft Skill (*Non Technical / Soft Skill*)	260	980	4	1
Jumlah (*Total*)	**1170**	**2942**	**181**	**103**

Nuklear Malaysia menerima peruntukan dari tiga sumber utama bagi membiayai kos latihan yang disediakan iaitu peruntukan HCD-STI dari MOSTI, peruntukan mengurus dan Dana Akaun Amanah (Jadual 15.2).

Nuclear Malaysia received funding from three major sources to support training cost namely HCD-MOSTI Fund, Operating Budget and Nuclear Malaysia Trust Fund (Table 15.2).

Jadual 15.2: Jenis-jenis peruntukan bagi program-program Latihan.
Table 15.2: Funds for Training Programmes.

Bil	Jenis Dana *Fund*	Peruntukan *Allocation* (RM)	Perbelanjaan *Expenditure* (RM)	Peratus Perbelanjaan *Percentage of Expenditure*
1.	HCD-MOSTI *HCD-MOSTI*	2.2 juta	2.1 juta	94
2.	Belanja Mengurus *Operating Budget*	0.22 juta	0.20 juta	91
3.	Akaun Amanah Nuklear Malaysia *Nuclear Malaysia Trust Account Fund*	0.16 juta	0.16 juta	100

Jadual 15.3: Kursus dalaman mengikut bidang kompetensi.
Table 15.3: Courses based on area of competency.

Kompetensi Utama	Sub Kompetensi	Peserta
Industri	Nanoteknologi *(Nanotechnology)*	19
	Teknologi Penyinaran (*Irradiation Technology)*	28
	Ujian Tanpa Musnah (*Non Destructive Testing*)	83
Jumlah		130
Keselamatan Dan Kesihatan Sinaran	Fizik Kesihatan (*Health Physics*)	178
	Kawalan Keselamatan Fizikal	62
	Keselamatan Makmal	44
	Keselamatan Nuklear dan Kawalan Bahan Radioaktif	85
	Sinaran Mengion: Metrology and Dosimetry	31
Jumlah		400
Reaktor, Kejuruteraan dan Tenaga Nuklear	Instrumentasi dan Automasi (*Automation and Instrumentation*)	28
	Kejuruteraan Awam (*Civil Engineering*)	30
	Kejuruteraan Kimia (*Chemical Engineering*)	15
	Loji dan Prototaip (*Plant and Prototype*)	15
	Reaktor (*Reactor*)	203
	Teknologi Akselerator (*Accelerator Technology*)	26
	Tenaga dan Kejuruteraan Nuklear (*Power and Nuclear Engineering*)	21
Jumlah		338
Alam Sekitar Dan Sisa Nuklear	Pengurusan Sisa (*Waste Management*)	22
	Radiokimia dan Alam Sekitar (*Radiochemistry and Environment*)	33
Jumlah		55
Pengurusan Teknologi Nuklear	Komunikasi Korporat (*Corporate Communication*)	62
	Latihan dan Pembelajaran (*Education and Training*)	21
	Pengurusan Kualiti dan Standard (*Standard and Quality Management*)	282
	Pengurusan Maklumat dan Pengetahuan (*Information and Knowledge Management*)	148
	Pengurusan R&D (*R&D Management*)	68
	Perancangan Kuasa Nuklear (*Nuclear Power Planning*)	191
	Teknologi Maklumat (*Information Technology*)	152
Jumlah		924
Pertanian Dan Bioteknologi	Agropengurusan (*Agromanagement*)	15
	Bioindustri (*Bioindustry*)	13
Jumlah		28
Perubatan Dan Bioteknologi	Pengeluaran Radioisotop dan Radiofarmasiutikal (*Production of Radioisotope and Radiopharmaceutical*)	87
Jumlah		87
Bukan Teknikal / Soft Skill	Kewangan	45
	Khidmat Korporat/Pengurusan	119
	Pembangunan Modal Insan (*Human Capital Development*)	683
	Pengurusan Am	133
Jumlah		980
Grand Total		***2498***

Jadual 15.4 : Kursus formal yang diikuti oleh pegawai Nuklear Malaysia
Table 15.4 : Formal course attend by Nuclear Malaysia staff

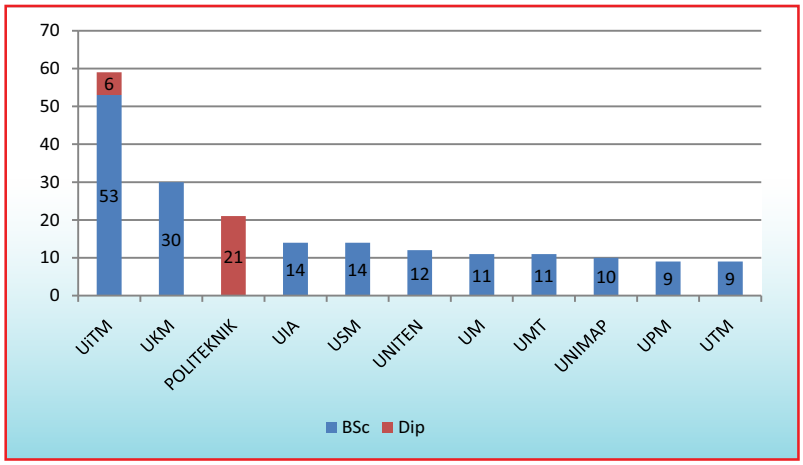
Negara	PhD	MSc	BSc	Dip	Jumlah
Malaysia	22	45	3	3	73
United Kingdom	13	1			14
Australia	2				2
Japan	2	2			4
Korea		4			4
USA	6				6
Jumlah	**45**	**52**	**3**	**3**	**103**

15.2 Program Latihan Industri Dan Kajian Penyelidikan Pelajar Institusi Pengajian Tinggi

Nuklear Malaysia juga menerima pelajar-pelajar dari institusi pengajian tinggi (IPT) menjalankan latihan amali dan projek tahun akhir di bawah bimbingan pegawai penyelidik dan pakar agensi. Sejumlah 98 pelajar telah diselia di mana sebilangan besar adalah dari program sarjana muda, diikuti dengan program sarjana, program ijazah kedoktoran, dan peringkat diploma. Bidang-bidang seliaan yang terlibat ialah kejuruteraan kimia, fizik, farmasi, sains alam sekitar, geologi, biologi, kejuruteraan mekanikal, mekatronik, kejuruteraan elektrik/elektronik, kejuruteraan awam, dan kejuruteraan computer. Seramai 249 pelajar dari pelbagai bidang telah menjalani latihan industri di Nuklear Malaysia.

15.3 Industrial Training And Research Program For Student Of Higher Institution

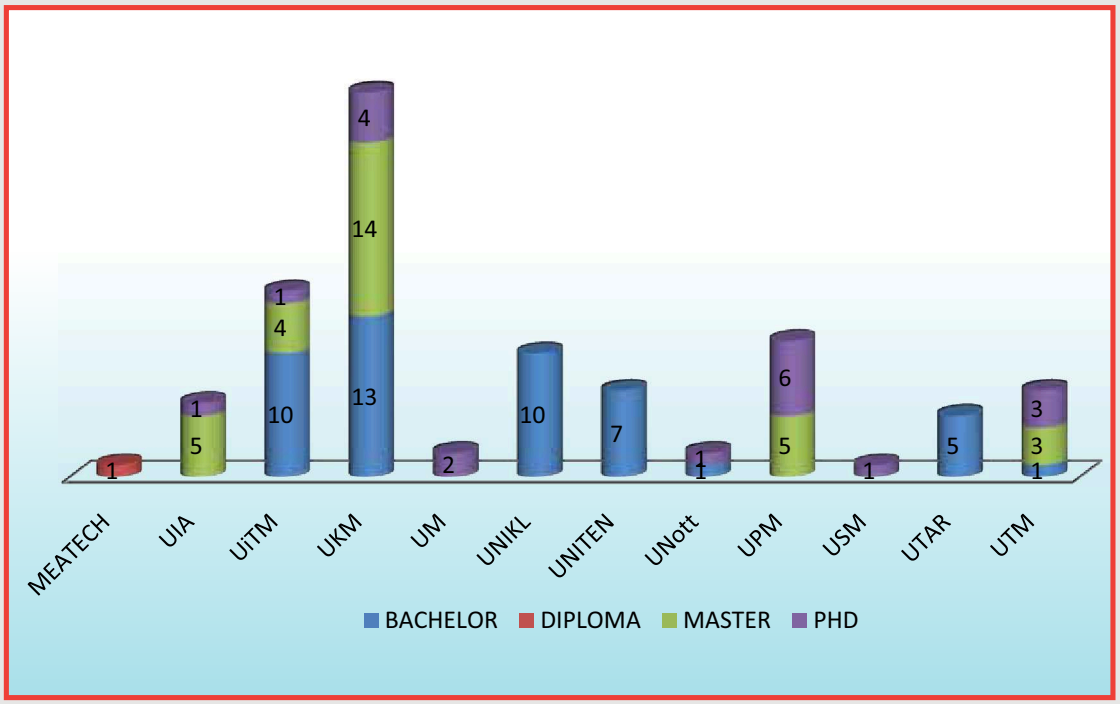
Nuclear Malaysia received students from institutions of higher learning (IHL) for their practical training and final year project supervised by agency's research officers and experts. A total of 98 trainees were supervised and a large percentage is from Bachelor Degree programme followed by Master Degree programme, Doctorate degree programmes, and Diploma Level. Number of research project being supervised by IPT and Course Program is shown in Figure 16.3 Fields or programmes supervised include chemical engineering, physics, pharmacy, environmental science, geology, biology, mechanical engineering, mechatronics, electrical/electronic engineering, civi engineering and computer engineering. A total of 249 students from various disciplines have undergone their industrial training at Nuclear Malaysia.



Rajah 15.2: Bilangan pelajar latihan industri berdasarkan IPT terpilih

Figure 15.2: Number of industrial training based on selected IHL

Foto 15.1: Taklimat kepada penuntut IPT.
Photo 15.1: Briefing to IHL students.



Rajah 15.3: Bilangan Pelajar Menjalankan Penyelidikan di Nuklear Malaysia
Figure 15.3: Number of Students Conducting Research in Nuclear Malaysia

15.3 Khidmat Pakar, Editor, Pewasit

Pegawai Nuklear Malaysia telah diberikan peluang sepenuhnya untuk meningkatkan kepakaran dan kemahiran mereka melalui program pembangunan keupayaan modal insan yang telah dilaksanakan. Kepakaran ini diiktiraf di peringkat kebangsaan dan antarabangsa. Semakin ramai pegawai Nuklear Malaysia diberi penghormatan untuk memberi khidmat pakar di samping terlibat sebagai pensyarah, penceramah, pewasit/ pemeriksa luar, juruaudit, editor, ahli panel dan penilai.

15.3 Expert Service, Editor, Referee

Staff of Nuclear Malaysia were given pportunity to enhance their expertise and skills through human capital development programme. Their expertises are recognised at national and international level. Many officers are also involved as referees, auditors, editors, panellists and evaluators

Jadual 15.5: Jumlah Aktiviti Khidmat Pakar Warga Nuklear Malaysia.
Table 15.5: Number Nuclear Malaysia Staff Involvement in Expert Services.

Bil. *No.*	Jenis Khidmat Pakar *Type of Expert Services*	Agensi *Agency*	Antarabangsa *International*	Kebangsaan *National*	Jumlah *Total*
1	Khidmat Pakar / Konsultan *Expert Services / Consultancy*	1	37	43	81
2	Pensyarah/Penceramah *Lecturer*	111	20	50	181
3	Pewasit/Pemeriksa Luar *Referee / External Examiner*	2	18	3	23
4	Juruaudit/Editor *Auditor / Editor*	4	4	5	13
5	Panel/Penilai *Panelist / Evaluator*	15	91	54	160

JADUAL 15.6 : SENARAI PEGAWAI NUKLEAR MALAYSIA UNTUK MISI PAKAR DI PERINGKAT ANTARABANGSA

TABLE 15.6 : LIST OF NUCLEAR MALAYSIA OFFICER FOR INTERNATIONAL EXPERT MISSION

BIL / *NO*	PROGRAM / *PROGRAMME*	PEGAWAI / *OFFICER*	TEMPAT / *VENUE*
1.	IAEA/RCA Regional Executive anagement Meeting for Policy Makers and rs on Green Radiation Processing for Agricultural, Environmental and Industrial Applications	Ahamad Sahali Bin Mardi	Ho Chi Minh, Vietnam
2.	IAEA Consultancy Meeting on PErvasive Computing Embedded Systems Middleware(PECES) Draft Document	Datin Zarina Binti Masood	Vienna
3.	Specialist Meeting on Mo-99 Production by Method	Dato' Dr. Rehir Bin Dahalan	Oarai, Jepun
4.	Research Coordination Meeting on Accelerator Based Alternatives to non HEU Production of MO-99/Tc-99m	Dato' Dr. Rehir Bin Dahalan	Vancouver, Kanada
5.	1st Research Coordination Meeting (RCM) on Radiometric Methods for Measuring and Modelling Multiphase Systems Towards Industrial Processes	Dr . Jaafar Bin Abdullah	Vienna, Austria
6.	TM on Establishing Developing and Maintaining Capacity Building in Member States	Dr . Mohd. Ashhar Bin Hj Khalid	Vienna, Austria
7.	Technical Meeting on Capacity Building and Human Resource Development for New and Expanding Nuclear Power Programmes	Dr . Mohd. Ashhar Bin Hj Khalid	Vienna
8.	Technical Meeting on the Role of Research Reactors and Related Infrastructure in the Development of Nuclear Energy Programmes	Dr . Mohd. Ashhar Bin Hj Khalid	Vienna
9.	First Research Contract Meeting (RCM) on Application of 3D Neutron Imaging and Tomography in Cultural Heritage Research	Dr . Muhammad Rawi Bin Mohamed Zin	Vienna
10.	IAEA CRP Technical Meeting on Radiation Curing of Composites for Enhancing Their Features and Utility in Healthcare and Industry	Dr . Nik Ghazali Bin Nik Salleh	Cairo, Egypt
11.	TM on Draft Implementing Guide on Physical Protection of Nuclear Material during Transport	Dr . Noriah Binti Mod Ali	Vienna, Austria
12.	IAEA Meeting on Supporting Climate-Proofing Rice Production Systems (CRiPS) Based on Nuclear Applications	Dr. Abdul Rahim Bin Harun	Manila, Filipina
13.	IAEA/RCA Final Progress Review Meeting of RAS/8/110 combining with Project Planning Meeting of RAS/1/013	Dr. Mahmood Bin Haji Dollah	Shanghai, China
14.	19th Meeting of the INPRO Steering Committee	Dr. Mohamad Puad Bin Hj Abu	Vienna, Austria
15.	Initial Coordination Meeting for Regional Project:Establishing a Radioactive Waste Management Infrastructure	Dr. Mohd Abd Wahab Bin Yusof	Manila, Filipina

BIL / *NO*	PROGRAM / *PROGRAMME*	PEGAWAI / *OFFICER*	TEMPAT / *VENUE*
16.	Int. Experts Meeting on Protection against Extreme Earthquakes and Tsunamis in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant	Dr. Mohd Abd Wahab Bin Yusof	Vienna
17.	IAEA_Consultancy meeting in Coordinating Nuclear Power Introduction in Malaysia - IAEA Integrated Masterwork Plan(IWK) for Building the Nuclear Power	Dr. Muhamad Bin Lebai Juri	Vienna
18.	3rd Steering Committee Meeting Between JAEA And Nuclear Malaysia	Dr. Muhamad Bin Lebai Juri	Malaysia
19.	Meeting with Korea Atomic Energy Research Institute (KAERI) and Seoul Forum S&T	Dr. Muhamad Bin Lebai Juri	Seol, Korea
20.	13th Ministerial Meeting (FNCA)	Dr. Muhamad Bin Lebai Juri	Jakarta, Indonesia
21.	Steering Committee on Education and Training in Radiation Protection and Waste Safety	Dr. Muhamad Bin Lebai Juri	Vienna
22.	The Fukushima ministerial Conference on Nuclear Safety	Dr. Muhamad Bin Lebai Juri	Fukushima, Jepun
23.	13th FNCA Coordinators Meeting dan Specialist Meeting on Mo-99 Production by (n, gamma) Method	Dr. Muhd Noor Bin Muhd Yunus	Fukui dan Tokyo, Jepun
24.	IAEA Standing Advisory Group on Nuclear Energy (SAGNE): Fifth Meeting in Fourth Term (SAGNE IV 5)	Dr. Muhd Noor Bin Muhd Yunus	Vienna
25.	FNCA-4th Meeting of Study Panel On The Approaches Towards Infrastructure Development For Nuclear Power	Dr. Muhd Noor Bin Muhd Yunus	Bangkok, Thailand
26.	3rd Steering Committee Meeting Between Jaea And Nuclear Malaysia	Dr. Muhd Noor Bin Muhd Yunus	Malaysia
27.	13th Ministerial Meeting (FNCA)	Dr. Muhd Noor Bin Muhd Yunus	Jakarta, Indonesia
28.	IAEA_Consultancy meeting in Coordinating Nuclear Power Introduction in Malaysia - IAEA Integrated Masterwork Plan(IWK) for Building the Nuclear Power	Dr. Noriah Binti Jamal	Vienna
29.	Consultancy Meeting on Preparation of a Publication on Socio and Macroeconomic Issues in National Nuclear Energy Decision Making	Dr. Zulkafli Bin Ghazali	Vienna
30.	IAEA Expert Mission to Assist in Development System for Training, Certification and Accreditation of NDT Personnel	Dr. Abdul Nassir Ibrahim	Addis Ababa, Ethiopia
31.	First Regional Coordination Meeting of Project RAS/1/106-Introducing Digital Industrial Radiography and Other Advance NDT Techniques	Dr. Abdul Nassir Ibrahim	Vienna, Austria
32.	Training on Level 3 Magnetic Particle Inspection	Dr. Abdul Nassir Ibrahim	Colombo, Sri Lanka

BIL / *NO*	PROGRAM / *PROGRAMME*	PEGAWAI / *OFFICER*	TEMPAT / *VENUE*
33.	13th FNCA Coordinators Meeting dan Specialist Meeting on Mo-99 Production by (n, gamma) Method	Dr. Kamaruddin Bin Hashim	Fukui dan Tokyo, Jepun
34.	IAEA/RCA Regional Executive Management Meeting for Policy Makers and End-users on Green Radiation Processing for Agricultural, Environmental and Industrial Applications	Dr. Kamaruddin Bin Hashim	Ho Chi Minh, Vietnam
35.	3rd TM of the Technical Working Group on Nuclear Power Infrastructure (TWG-NPI)	Dr. Mohamad Puad Bin Hj Abu	Vienna
36.	Consultancy Meeting (CS) on the Application of Research Reactors to Nuclear Education and Training	Dr. Mohamad Puad Bin Hj Abu	Prague, Republik Czech
37.	Consultancy Meeting (Cs) on Emerging Nuclear Power Power in Regional Contexts: Southeast Asia	Dr. Mohamad Puad Bin Hj Abu	Hanoi, Vietnam
38.	Consultancy Meeting (Cs) to Prepare an INPRO Dialogue Froum on Licensing and Safety Issues for Small and Medium – Sized Reactors	Dr. Mohamad Puad Bin Hj Abu	Vienna, Austria
39.	Technical Meeting on Strengthening of Biological Dosimetry in IAEA Member State	Dr. Mohd Rodzi Bin Ali	Vienna
40.	Asia and the Pacific National Liaison Officer (NLO) Meeting	Dr. Noriah Binti Jamal	Vienna
41.	Regional Project First Coordination Meeting on Supporting Decision Making for Nuclear Power Planning and Development	Dr. Noriah Binti Jamal	Beijing, China
42.	Mesyuarat Persediaan Ketiga Peringkat Sherpa Bagi Sidang Kemuncak Keselamatan Nuklear 2012	Dr. Noriah Binti Jamal	New Delhi, India
43.	IAEA/RCA Project Planning and Coordination Meeting bagi projek 'Support Mutation Breeding Approaches to Develop New Crop Varieties Adaptable to Climate Change'	Dr. Rusli Bin Ibrahim	Vienna, Austria
44.	Lawatan Saintifik Advanced Mutation and Molecular Breeding for Enhanced and Sustainable Rice Production	Dr. Rusli Bin Ibrahim	Beijing, China
45.	Technical Meeting on Utilization of Ion Accelerators for Studying and Modelling Ion Induced Radiation Defects in Semiconductors and Insulators	Dr.Yusof Bin Abdullah	Vienna
46.	IAEA/RCA Final Progress Review Meeting of Project RAS/5/050, combining with Project Planning Meeting of RAS/5/057	Dr.Zainon Binti Othman	Hanoi, Vietnam
47.	IAEA Project Planning and Coordination Meeting on Building Technolong Capacity for Food Traceability and Food Safety Control Systems through the Use of Nuclear Analytical Techniques	Dr.Zainon Binti Othman	Fuzhou, China

BIL / *NO*	PROGRAM / *PROGRAMME*	PEGAWAI / *OFFICER*	TEMPAT / *VENUE*
48.	Consultative meeting of INIS Liaison Officers	Iberahim Bin Ali	Vienna, Austria
49.	Regional Meeting on Providing Decision Support for Nuclear Power Planning and Development	Jamal Khaer Bin Ibrahim	Tokyo, Jepun
50.	Reactor Engineering Course I, II and III	Julia Binti Abdul Karim	Tokai, Jepun
51.	TM on Modelling and Data for Radiological Impact Assessments (MODARIA)	Khairuddin Bin Mohamad Kontol	Vienna, Austria
52.	Technical Meeting to Facilitate an International Community of Practice on Nuclear Knowledge Management	Mohamad Safuan Bin Sulaiman	Vienna, Austria
53.	Technical Meeting on Implications of TEPCOs Fukushima Daiichi Accident on the Safety of Research Reactors	Mohammad Suhaimi Bin Kassim	Vienna, Austria
54.	Technical Meeting on Hands-on Experience in Developing and Managing Nuclear Power Programmes	Mohd Amin Sharifuldin Bin Salleh	Ulsan, Korea
55.	Technical Meeting on Dosimetry and Comparisons in Diagnostic Radiology at the SSDL level	Muhammad Jamal Bin Md Isa	Seibersdorf, Austria
56.	Technical Meeting to Discuss the Intercomparison Project PRISM on Demonstrating the Safety of Near Surface Disposal	Nik Marzukee Bin Nik Ibrahim	Vienna
57.	Pilot Peer Review Mission for Self Assessment on the Education and Training for Nuclear Safety Human Resource Development	Rabiah Binti Abu Hassan	Jakarta, Indonesia
58.	Asia and the Pacific National Liaison Officer (NLO) Meeting	Raja Jamal Bin Raja Hedar	Vienna
59.	TM on Implementation of E-Learning Platforms for Nuclear Education and Training	Siti Nurbahyah Binti Hamdan	Vienna

15.7 : PENSYARAH/PENCERAMAH/FASI
15.7 : LECTURER/SPEAKER/FACILITATOR

BIL *NO*	NAMA *NAME*	TAJUK / BUTIRAN AKTIVITI *TOPIC / ACTIVITIES*	TEMPAT *VENUE*	PERINGKAT KEBANGSAAN *NATIONAL LEVEL*
1	ABD AZIZ BIN MHD RAMLI	Kursus Perlindungan Sinaran Untuk Pegawai	Nuklear Malaysia	Kebangsaan
		Radiation Safety & Health(RSH)	Pusat Latihan, Nuklear Malaysia	Agensi
2	ABD. NASSIR BIN IBRAHIM, DR	2nd South East Asia Regional Workshop on safety and security of radioactive source used for industrial radiography	Putrajaya	Antarabangsa
		Sharing best practices for enhancing the security of high activity radioactive sources (The role of Professional Society for Enhancing the security and safety of radioactive sources)	Bohol, Phillippines	Antarabangsa
3	AHMAD BAZLIE BIN ABDUL KADIR	Demostrator untuk IAEA Postgraduate Course in radiation Protection and safety of radiation sources: Tajuk:1. domostration II-11 reading of films for individual dosimetry, 2. Demonstration Reading of TL Dosimeter 3. demonstration VI-2 TL dosimetry and film dosimetry for personal dose assess	Nuklear Malaysia	Antarabangsa
4	CHANTARA THEVY RATNAM	International Symposium on Advanced Polymeric Materials 2012 (ISAPM 2012)	Kuala Lumpur	Antarabangsa
5	FARIDAH BINTI MOHAMAD IDRIS, DR	Introductory Course on Particle Physics	Jabatan Fizik, Universiti Malaya	Kebangsaan
6	HAIRUL NIZAM B. IDRIS	IAEA Postgraduate Educational Course In Radiation Protection And The Safety Of Radiation Sources (PGEC9)	Agensi Nuclear Malaysia	Antarabangsa
		Radiation Protection Course for Officer	Agensi Nuclear Malaysia Pusat Latihan, Nuklear	Kebangsaan
		Radiation Safety & Health(RSH)	Malaysia	Agensi
7	ILHAM MUKRIZ BIN ZAINAL ABIDIN, DR.	2012 Far East Forum on Nondestructive Evaluation/Testing (NDE/T): New Technology and Application	Hefei, Anhui, China	Antarabangsa
		Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
		Pensyarah Pelawat di UNIMAP	Perlis	Kebangsaan
		Seminar Fizik Gunaan USIM 2012	USIM	Kebangsaan
		Technical Talk on NDT	Jiangnan University, China	Antarabangsa
8	JAMALIAH SHARIF	Kursus "Chemical pollution in water resources"	Nuklear Malaysia	Agensi
9	JULIA BINTI ABDUL KARIM	1st FTC on Reactor Engineering	Nuklear Malaysia	Kebangsaan
10	KHAIRUDDIN BIN ABDUL RAHIM, DR	EU-Asia Biomass Best Practices and Bussiness Partnering Conference 2012	PWTC Kuala Lumpur.	Kebangsaan
11	KONSOH @ JOHN KONSOH BIN SANGAU	IAEA Postgraduate Course On Radiation Protection and The Safety of Radiation Sources (PGEC-9).	Nuklear Malaysia, Kajang	Antarabangsa
		Klinik ISO/IEC 17025 bagi Pusat Instrumentasi dan Automasi, Nuklear Malaysia.	Nuklear Malaysia, Kajang	Agensi
12	MAHMOOD BIN DOLLAH, DR	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
		Radiation Safety & Health(RSH)	Pusat Latihan, Nuklear Malaysia	Agensi

BIL *NO*	NAMA *NAME*	TAJUK / BUTIRAN AKTIVITI *TOPIC / ACTIVITIES*	TEMPAT *VENUE*	PERINGKAT KEBANGSAAN *NATIONAL LEVEL*
13	MD SUHAIMI BIN ELIAS	Chemical Safety and Health	Johor Bharu Pusat Latihan, Nuklear	Kebangsaan
		Keselamatan Persekitaran Dan Kesihatan(ESH)	Malaysia	Agensi
		Radiation Safety and Health	Johor Bharu	Kebangsaan
14	MEOR YUSOFF BIN MEOR SULAIMAN, DR	International conference on Materials Science and Applications 2012	Taif, Saudi Arabia	Antarabangsa
		International Symposium on Rare Earths 2012	KL	Antarabangsa
		Seminar on X-ray Analyzer 2012	Seri Kembangan	Antarabangsa
15	MOHAMAD SAFUAN BIN SULAIMAN	Process Oriented Knowledge Management (POKM) Workshop	Dewan Tun Dr. Ismail Blok 11, Agensi Nuklear Malaysia	Agensi
16	MOHD ABD WAHAB BIN YUSOF, DR	Radiation Safety & Health(RSH)	Pusat Latihan, Nuklear Malaysia	Agensi
17	MOHD FAZLIE BIN ABDUL RASHID	Bengkel Peningkatan Pengetahuan ke Arah Kecemerlangan Perkhid-matan	Cherating	Agensi
		Follow-Up Training Course on Nuclear and Radiological Emergency Preparedness and Response	Nuklear Malaysia	Kebangsaan
		Karnival Sains dan Inovasi Zon Selatan	Johor Bahru	Kebangsaan
		Kursus Induksi Pelatih Luar Siri 1/2012	Bilik Seminar	Agensi
		Kursus Induksi Pelatih Luar Siri 2/2012	Bilik Seminar	Agensi
		Kursus Kesedaran Sinaran dan Asas First Aider untuk UKF	Blok 72	Agensi
		Kursus Perlindungan Sinaran Untuk Pekerja	Nuklear Malaysia	Kebangsaan
		Program Ceramah Kesedaran Awam Mengenai Teknologi Nuklear, PPD Klang	Klang	Kebangsaan
		Program Ceramah Kesedaran Awam Mengenai Teknologi Nuklear, PPD Sepang	Sepang	Kebangsaan
		Program Kesedaran Mengenai Keperluan Pelan Kecemasan, MARPA-AELB	Bangi	Kebangsaan
		Program Kesedaran Mengenai Keperluan Pelan Kecemasan, MARPA-AELB	Pulau Pinang	Kebangsaan
		Program Latihan Nuclear And Radiological Emergency Preparedness and Response Siri 2	Bilik Seminar	Agensi
		Program Latihan Nuclear And Radiological Emergency Preparedness and Response Siri 3	Bilik Seminar	Agensi
		Radiation Protection Course for Officer	Nuklear Malaysia	Kebangsaan
		Radiation Safety and Health Course	Nuklear Malaysia	Kebangsaan
18	MOHD HAFIZAL BIN YUSOF	Ceramah Sekolah di Pulau Pinang	3 buah sekolah di Pulau Pinang	Kebangsaan
		Ceramah Sekolah di Terengganu	3 buah sekolah Terengganu	Kebangsaan
		Jemputan ceramah Teknologi Nuklear di SMK Seksyen 9, Shah Alam, Selangor	SMK Seksyen 9, Shah Alam	Agensi
		Projek ceramah dan pameran sekolah-sekolah di Malaysia (Pahang)	3 buah sekolah di Pahang	Kebangsaan

BIL *NO*	NAMA *NAME*	TAJUK / BUTIRAN AKTIVITI *TOPIC / ACTIVITIES*	TEMPAT *VENUE*	PERINGKAT KEBANGSAAN *NATIONAL LEVEL*
19	MOHD HANAFIAH BIN CHIK	Kursus Asas Keselamatan Makmal dan Bengkel 2012 - Keselamatan Elektrik	DTI	Agensi
20	MOHD HASNOR BIN HASAN	Projek Ceramah dan Pameran Sekolah-sekolah Menengah di Malaysia Penggal 1, 2012	Malaysia	Kebangsaan
21	MOHD NOORUL IKHSAN BIN MOHAMED	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
22	MOHD SIDEK BIN OTHMAN	Bengkel good radiation safety practice	Agensi Nuklear malaysia	Agensi
		Kursus Radiation Protection Officer	Bangi	Kebangsaan
		PGEC in Radiation Protection and the Safety of Radiation Sources	Bangi	Antarabangsa
		Radiation Safety & Health(RSH)	Pusat Latihan, Nuklear Malaysia	Agensi
23	MOHD YUSNISYAM BIN YUSOF	Kursus Radiografi Industri Untuk Pengendali Pelatih (Bahagian 1)	Agensi Nuklear malaysia Pusat Latihan, Nuklear	Kebangsaan
		Penilaian tanpa Musnah(NDT)	Malaysia	Agensi
24	MUHD NOOR BIN MUHD YUNUS, DR	Nuclear Science, Technology & Engineering Conference 2012 (NUSTEC)	TNB Research Kajang, Selangor	Kebangsaan
25		Process Oriented Knowledge Management (POKM) Workshop	Dewan Tun Dr. Ismail Blok 11,Nuklear Malaysia	Agensi
26	MUNIRA BINTI SHAIKH NASIR	Kursus Induksi Pelatih Luar Siri 1/2012	Bilik Seminar	Agensi
		Kursus Induksi Pelatih Luar Siri 2/2012	Bilik Seminar	Agensi
		Kursus Induksi Pelatih Luar Siri 3/2012	Bilik Seminar	Agensi
27	NOOR AZREEN BIN MASENWAT	Concrete Inspection Technology Technical Talk	Puchong Utama	Kebangsaan
		Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
		Program Radiografi Industri untuk Pengendali Pelatih (Bah 1)	Agensi Nuklear malaysia	Agensi
		Program Radiografi Industri untuk Pengendali Pelatih (Bah 2)	Agensi Nuklear malaysia	Agensi
28	NORASALWA BINTI ZAKARIA, DR	1st FTC on Reactor Engineering	Nuklear Malaysia	Kebangsaan
29	NORHAYATI ABDULLAH	Kursus Kesedaran Radiologi	Agensi Nuklear malaysia	Agensi
		Radiation Protection for Officer (RPO) Course	Agensi Nuklear malaysia	Agensi
		Radiation Safet Awareness	Agensi Nuklear malaysia	Agensi
		Radiation Safety & Health(RSH)	Pusat Latihan, Nuklear Malaysia	Agensi
		Sinar X Perubatan(MXR)	Pusat Latihan, Nuklear Malaysia	Agensi
		Training Course on X-ray for General Practitioner	Agensi Nuklear malaysia	Agensi
30	NORPAIZA BIN MOHD HASAN, DR	Radiation Protection for Officer (RPO)	Agensi Nuklear malaysia	Agensi
		Radiation Protection for worker (RPW)	Agensi Nuklear malaysia	Agensi
		Radiation Safety & Health(RSH)	Pusat Latihan, Nuklear Malaysia	Agensi
31	NORRIZA BINTI MOHD ISA	Sinar X Perubatan(MXR)	Pusat Latihan, Nuklear Malaysia	Agensi
32	SHAFII BIN KHAMIS, DR	Ijazah Sarjana sains Pharmaceutical Analysis	UKM, KL	Kebangsaan
		Introduction to Radiopharmacy	Biro Pengawalan Farmasiutikal Kebangsaan, PJ	Kebangsaan
		Kursus Good Manufacturing Practice (GMP)	Agensi Nuklear malaysia	Agensi

BIL *NO*	NAMA *NAME*	TAJUK / BUTIRAN AKTIVITI *TOPIC / ACTIVITIES*	TEMPAT *VENUE*	PERINGKAT KEBANGSAAN *NATIONAL LEVEL*
		Kursus Pengimejan Radionuklid	Universiti Kebangsaan Malaysia, KL	Kebangsaan
		Kursus Radiation Protection for Officers (RPO)	Agensi Nuklear malaysia	Kebangsaan
		Radiation Safety & Health(RSH)	Pusat Latihan, Nuklear Malaysia	Agensi
		Radiopharmacy (B.Sc Pharmacy)	CUCMS,Cyberjaya	Kebangsaan
			UM, KL	Kebangsaan
		Radiopharmacy Course	Universiti Malaya, KL	Kebangsaan
33	SHAHARUDIN SAYUTI	Industrial Radiography Level 1	Nuklear Malaysia	Kebangsaan
		Radiation Protection Officer (RPO)-Industry Level 2, Radiography Industri	Nuklear Malaysia	Kebangsaan
		Radiation Safety Awareness	Nuklear Malaysia	Kebangsaan
		Shielding & calculation design of exposure room	Nuklear Malaysia	Agensi
		Trainee Industrial Radiography	Nuklear Malaysia	Kebangsaan
34	SHAHARUM BIN RAMLI	2nd Follow-up Training Course in Reactor Engineering	Nuklear Malaysia	Kebangsaan
35	SITI A IASAH BINTI HASHIM	Regional Annual Fundamental Science Symposium 2012 (RAFSS 2012)	Johor Bahru	Antarabangsa
36	SITI MADIHA BINTI MUHAMMAD AMIR	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
		Regional Training Course in Digital Industrial Radiography Technique for Personnel Already Certified in Radiography Level 2	Agensi Nuklear malaysia	Antarabangsa
37	SOBRI BIN HUSSEIN.DR	Current Research Projects at Agrotechnology and Biosciences Division, Nuclear Malaysia	Uni Of Gent	Antarabangsa
38	SUHAIRY SANI	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
		Training Course on Industrial Radiography Level I	Nuklear Malaysia	Agensi
39	TAIMAN BIN KADNI	Pensyarah dan demontrator untuk kursus Postgraduate Educational Course in Radiation Protection and the Safety of Radiation Sources.	Nuklear Malaysia	Antarabangsa
		Radiation Protection Seminar 2012	Pusat Perubatan Uni. Malaya	Kebangsaan
40	WAN SAFFIEY BIN WAN ABDULLAH (DR)	In-company Program: radiation Safety Awareness	Petronas, KLCC; Petronas Chemical, Trg; Petronas KLCC, Pen Fiber PP, Denso BBB, MEMC Sunway	Agensi
		Kursus PGEC, IAEA	Nuklear Malaysia	Antarabangsa
		Kursus RPO	Nuklear Malaysia	Agensi
		Kursus Radiation Safety and Health	Nuklear Malaysia	Agensi
		Laser Safety Course	In-house: Thermik Technology, NM	Agensi
		Taklimat Kesedaran Awam RF/MW	Pasir Gudang & Subang	Kebangsaan
41	WEE BOON SIONG, DR.	Kursus Pencemaran Kimia dalam Sumber Air	Bangi	Agensi
42	YII MEI WO	FTC Environmental Monitoring	Nuklear Malaysia	Agensi
		Kursus " PostGraduate Educational Course (PGEC) in Radiation Protection and The Safety of Radiation Sources	Nuklear Malaysia	Antarabangsa
		Kursus "Awareness Seminar on Radiation Safety for OBTL"	Pulau Pinang	Agensi

BIL *NO*	NAMA *NAME*	TAJUK / BUTIRAN AKTIVITI *TOPIC / ACTIVITIES*	TEMPAT *VENUE*	PERINGKAT KEBANGSAAN *NATIONAL LEVEL*
		Kursus "Keselamatan Kimia dan Kesihatan"	Bintulu	Agensi
			Johor Bahru	Agensi
			Kota Kinabalu	Agensi
			Nuklear Malaysia	Agensi
			Pulau Pinang	Agensi
		Kursus "Radiation Safety and Health"	Johor Bahru	Agensi
			Pulau Pinang	Agensi
		Kursus "Radiation Safety Awarness"	Kemaman	Agensi
			Nuklear Malaysia	Agensi
			Petaling Jaya (In-company, Omron Malaysia Sdn. Bhd.)	Agensi
		Kursus "Radiological Monitoring & Measurement"	Nuklear Malaysia	Agensi
43	ZAKARIA BIN TAIB	Kursus Induksi	Nuklear Malaysia	Agensi
44	ABDUL BAKHRI BIN MUHAMAD	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
45	ABDUL RAHIM BIN HARUN, DR	Plant Breeding Seminar: Advance in Plant Improvement	Agro-Biotechnology Institute Malaysia, Serdang	Kebangsaan
46	ABDUL RAHIM BIN MOHD RAZALI	Building Wiring Installasion	Akademi Binaan Malaysia	Kebangsaan
47	AHMAD NASIR BIN YUSOF	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
48	AMRY AMIN BIN ABAS	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
49	ANDY KONG SHIN SHYEN	1st FTC on Reactor Engineering	Nuklear Malaysia	Kebangsaan
50	ARSHAD BIN YASSIN	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
51	ASMALIZA BT HASHIM	Radiation Safety & Health(RSH)	Pusat Latihan, Nuklear Malaysia	Agensi
		Sinar X Perubatan(MXR)	Pusat Latihan, Nuklear Malaysia	Agensi
52	AWANG SAFARUDDIN BIN AWANG PUTRA	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
53	AZHAR BIN AZMI	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
54	AZIZ BIN AMAT	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
55	AZUHAR B. RIPIN	Sinar X Perubatan(MXR)	Pusat Latihan, Nuklear Malaysia	Agensi
56	HASFAZILAH HASSAN	Keselamatan Persekitaran Dan Kesihatan(ESH)	Pusat Latihan, Nuklear Malaysia	Agensi
57	HUSAINI B. SALLEH	Sinar X Perubatan(MXR)	Pusat Latihan, Nuklear Malaysia	Agensi
58	IBERAHIM ALI	Pengurusan Teknologi(MGT)	Pusat Latihan, Nuklear Malaysia	Agensi
59	JAAFAR BIN ABDULLAH, DR	Radiation Safety & Health(RSH)	Pusat Latihan, Nuklear Malaysia	Agensi
60	KAMARUDDIN BIN HASHIM, DR	Postgradute Educational Course on Radiation Protection anjuran IAEA/Nuklear Malaysia	Agensi	Antarabangsa
		Seminar Kesedaran Amalan Baik Akuakultur	Kuching	Kebangsaan
61	KHAIRONIE BIN MOHD TAKIP	1st FTC on Reactor Engineering	Nuklear Malaysia	Kebangsaan
62	KHAIRUL ANUAR BIN MOHD SALLEH	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
63	KHAIRUL AZHAR BIN SADERI	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
64	MASROL NIZAM BIN SALLEH	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi

BIL *NO*	NAMA *NAME*	TAJUK / BUTIRAN AKTIVITI *TOPIC / ACTIVITIES*	TEMPAT *VENUE*	PERINGKAT KEBANGSAAN *NATIONAL LEVEL*
65	MOHAMAD BIN DAUD DR	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
66	MOHD AZMI ISMAIL, DR.	Radiation Safety & Health(RSH)	Pusat Latihan, Nuklear Malaysia	Agensi
67	MOHD FAIRUS BIN ABDUL FARID	1st FTC on Reactor Engineering	Nuklear Malaysia	Kebangsaan
68	MOHD KAMAL SHAH BIN SHAMSUDDIN	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
69	MOHD KHALID B. MATORI	Sinar X Perubatan(MXR)	Pusat Latihan, Nuklear Malaysia	Agensi
70	MOHD KHIDIR BIN KAMARON	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
71	MOHD RIZAL BIN MAMAT @ IBRAHIM	1st FTC on Reactor Engineering	Nuklear Malaysia	Kebangsaan
72	Mohd Suhaimi Hamzah, Dr	Keselamatan Persekitaran Dan Kesihatan(ESH)	Pusat Latihan, Nuklear Malaysia	Agensi
73	MOHD ZAKI UMAR	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
		Regional Training Course On Digital Industrial Radiography Technique For Personnel Already Certified In RT Level 2	Bangi, Selangor	Antarabangsa
74	MUHAMMAD JAMAL B. MD ISA	Radiation Safety & Health(RSH)	Pusat Latihan, Nuklear Malaysia	Agensi
		Sinar X Perubatan(MXR)	Pusat Latihan, Nuklear Malaysia	Agensi
75	NOOR EZATI SHUIB	Keselamatan Persekitaran Dan Kesihatan(ESH)	Pusat Latihan, Nuklear Malaysia	Agensi
76	NOORHAZLEENA BINTI AZAMAN	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
77	NORFAIZAL BIN MOHAMED @ MUHAMMAD	Keselamatan Persekitaran Dan Kesihatan(ESH)	Pusat Latihan, Nuklear Malaysia	Agensi
		Klinik ISO/IEC 17025 Bil. 01/2012	Agensi Nuklear malaysia	Agensi
		Program Lawatan Sambil Belajar Universiti Teknologi MARA, Cawangan Perlis ke Agensi Nuklear Malaysia	Agensi Nuklear malaysia	Kebangsaan
78	NURUL A'IN BT AHMAD LATIF	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
79	RAHMAD B. ABD. RASHID	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
80	ROHA TUKIMIN	Keselamatan Persekitaran Dan Kesihatan(ESH)	Pusat Latihan, Nuklear Malaysia	Agensi
81	ROZAIMAH ABDUL RAHIM	Keselamatan Persekitaran Dan Kesihatan(ESH)	Pusat Latihan, Nuklear Malaysia	Agensi
82	SAIDI BIN RAJAB	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
83	SAPIZAH BINTI RAHIM	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
84	SHAHARUDIN B. SAYUTI	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
		Radiation Safety & Health(RSH)	Pusat Latihan, Nuklear Malaysia	Agensi
85	SHAMSIAH ABD RAHMAN	Keselamatan Persekitaran Dan Kesihatan(ESH)	Pusat Latihan, Nuklear Malaysia	Agensi
86	SUAIB BIN IBRAHIM	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
87	SUKHRI B. AHMAD	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi
88	SYED ASRAF FAHLAWI WAFA BIN SYED MOHD GHAZI	1st FTC on Reactor Engineering	Nuklear Malaysia	Kebangsaan
		Radiation Safety & Health(RSH)	Pusat Latihan, Nuklear Malaysia	Agensi
89	WAN HAZLINDA BT ISMAIL	Sinar X Perubatan(MXR)	Pusat Latihan, Nuklear Malaysia	Agensi
90	WAN ZAINAL ABIDIN B WAN MD MARZUKI	Penilaian tanpa Musnah(NDT)	Pusat Latihan, Nuklear Malaysia	Agensi

JADUAL 15.8 : PEWASIT/PEMERIKSA LUAR
TABLE 15.8 : EXTERNAL EXAMINER

BIL *NO*	NAMA *NAME*	TAJUK / BUTIRAN AKTIVITI *TOPIC / ACTIVITIES*	TEMPAT *VENUE*	PERINGKAT *LEVEL*
1	AHMAD ZAINURI MOHD DZOMIR	Journal of Food Processing and Preservation	United States	Antarabangsa
2	CHANTARA THEVY RATNAM	International Journals (Journal of Applied Polymer Science, Journal of Vinyl Additive and Technology, Journal of Composite Materials, Journal Of Materials and Design		Antarabangsa
3	HASNI BINTI HASAN	EJSNM (Malaysian Nuclear Science Journal-Electronic Version), Article "Development of 3D CFD Simulation Method in Nuclear Reactor Safety Analysis"	Nuklear Malaysia	Kebangsaan
4	ILHAM MUKRIZ BIN ZAINAL ABIDIN, DR.	Journal of Multidiscipline Modeling in Materials and Structures		Antarabangsa
5	JAMALIAH SHARIF	material and design	elsevier, USA	Antarabangsa
		JNRT	Nuclear malaysia	Antarabangsa
		journal of applied polymer science	wiley, USA	Antarabangsa
		material and design journal	elsevier, USA	Antarabangsa
6	JONG BOR CHYAN, DR	ISABB Journal of Biotechnology and Bioinfomatics	USA	Antarabangsa
7	KOK KUAN YING, DR	Advanced Materials Research, Trans Tech Publication	Trans Tech Publication	Antarabangsa
8	MEOR YUSOFF BIN MEOR SULAIMAN, DR	Journal of Advanced Materials Research, Transtech Publication	Zurich	Antarabangsa
		Journal of Physical Science, USM Publication	Penang	Kebangsaan
9	MOHD HAMZAH BIN HARUN	Journal Polymer Composite (Wiley Blackwell)		Antarabangsa
10	NORPAIZA BIN MOHD HASAN, DR	International Journal of Engineering, Science and Technology	MultiCraft Ltd. Nigeria	Antarabangsa
		Particuology Journal	Elsevier B.V. Ltd, Holland	Antarabangsa
11	SERI CHEMPAKA BT. MOHD. YUSOF (DR)	Pegawai Pemeriksa Aset Bahagian Agroteknologi dan Biosains	Nuklear Malaysia	Agensi
12	SHAHARUDIN SAYUTI	Peperiksaan Radiografi Industri Tahap 2	Nuklear Malaysia	Kebangsaan
13	SITI A IASAH BINTI HASHIM	2012 IEEE Colloquium on Humanities, Science and Engineering Research (melalui sistem EDAS)	Kota Kinabalu Sabah	Antarabangsa
		The 2012 IEEE Symposium on Business, Engineering and Industrial Applications (ISBEIA2012) - (melalui sistem EDAS)	Bandung	Antarabangsa
14	SUHAIRY SANI	Permarkahan laporan projek kajian, peperiksaan khas untuk memasuki skim Penolong Jurutera Gred J29, kenaikan pangkat secara lantikan (KPSL) siri 1/2011	Nuklear Malaysia	Agensi
15	WEE BOON SIONG, DR.	Journal of Radioanalytical and Nuclear Chemistry	Budapest, Hungary	Antarabangsa

JADUAL 15.9 : JURUAUDIT
TABLE 15.9 ; AUDITOR

BIL *NO*	NAMA *NAME*	TAJUK / BUTIRAN AKTIVITI *TOPIC / ACTIVITIES*	TEMPAT *VENUE*	PERINGKAT *LEVEL*
1	ABD. NASSIR BIN IBRAHIM, DR	Electronic Journal Sains Nuklear Malaysia(Ketua Editor)	Nuklear Malaysia	Kebangsaan
2	AHMAD ZAINURI MOHD DZOMIR	Audit dalam ISO/IEC17025 Bil 7/2012	Bangi	Agensi
		e-JSNM		Kebangsaan
		International Journal of Polymer Science		Antarabangsa
		International Scholarly Research Network		Antarabangsa
3	CHANTARA THEVY RATNAM	Malaysian Polymer Journal		Antarabangsa
4	JAMALIAH SHARIF	Journal Sains Nuklear Malaysia (JSNM)	Nuklear Malaysia	Kebangsaan
5	KONSOH @ JOHN KONSOH BIN SANGAU	Audit Dalaman Akreditasi ISO/IEC 17025:2005 bagi Makmal Fizik Perubatan, Nuklear Malaysia.	Nuklear Malaysia, Kajang	Agensi
		Audit Dalaman Akreditasi ISO/IEC 17025:2005 bagi Makmal Radiokimia (RAS), Nuklear Malaysia.	Nuklear Malaysia, Kajang	Agensi
		Persatuan Perlindungan Sinaran Malaysia (MARPA).	Nuklear Malaysia, Kajang	Kebangsaan
6	NORPAIZA BIN MOHD HASAN, DR	Jurnal Sains Nuklear Malaysia versi electronic	Agensi Nuklear malaysia	Kebangsaan
7	WEE BOON SIONG, DR.	Jurnal Sains Nuklear Malaysia	Bangi	Agensi

JADUAL 15.10 : PANEL
TABLE 15.10 : PENILAI

BIL *NO*	NAMA *NAME*	TAJUK / BUTIRAN AKTIVITI *TOPIC / ACTIVITIES*	TEMPAT *VENUE*	PERINGKAT *LEVEL*
1	ABD AZIZ BIN MHD RAMLI	3RD STEERING COMMITTEE MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
		Panel Penilai Bagi R&D Project Evaluation	Nuklear Malaysia	Agensi
		Panel Penilai Elaun Khas Pengendali Reaktor Nuklear dan Loji	Nuklear Malaysia	Agensi
2	ABD. NASSIR BIN IBRAHIM, DR	Hari Innovasi UIA	UIA Gombak	Kebangsaan
3	AHMAD NABIL BIN AB RAHIM	Norwegian Extrabudgetary Programme on Strenghthening Nuclear Safety Competence in Developing Country: Joint Essential Knowledge Workshop: Evaluation of the Safety Analysis Report	Movenpick Hotel, Hanoi,	Antarabangsa
4	AHMAD ZAINURI MOHD DZOMIR	Panel Penilai Elaun Khas Pengendali Reaktor Nuklear dan Loji	Bangi	Agensi
5	FARIDAH BINTI MOHAMAD IDRIS, DR	11th Open Meeting of the Belle II Collaboration	IPNS and KEK, Tsukuba	Antarabangsa
6	HAIRUL NIZAM B. IDRIS	3RD STEERING COMMITTEE MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
7	ILHAM MUKRIZ BIN ZAINAL ABIDIN, DR.	Anugerah Inovasi Negara 2012	Malaysia	Kebangsaan
		Jawatankuasa Keputusan Peperiksaan NDT	Jabatan Pembangunan Kemahairan (JPK)	Kebangsaan
		Jawatankuasa Permohonan Persijilan NDT	Jabatan Pembangunan Kemahairan (JPK)	Kebangsaan
		Temuduga Hadiah Latihan Persekutuan JPA, 2012	UNITEN	Kebangsaan
8	JAMALIAH SHARIF	Jawatankuasa teknikal nanoteknologi ISO TC229	SIRIM	ebangsaan
		pemilihan kertas kerja terbaik Seminar R&D 2012	Nuklear Malaysia	Agensi
		penilaian projek PQRD dan Science Fund	Nuklear Malaysia	Kebangsaan
		peperiksaan perkhidmatan dan KPSL	Agensi Nuklear malaysia	Kebangsaan
		R&D Evaluation 2012	Nuklear Malaysia	Agensi
9	JAMILAH BINTI KARIM	Panel Pakar Bagi Pembangunan Standard Kemahiran Pekerjaaan Kebangsaan (NOSS)	Agensi Nuklear malaysia	Kebangsaan
10	JONG BOR CHYAN, DR	31st Symposium of the Malaysian Society for Microbiology,	Kota Kinabalu, Sabah	Kebangsaan
11	JULIA BINTI ABDUL KARIM	3RD STEERING COMMITTEE MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
		Kick-Off Meeting on Extra-Budgetary norwegian Probability Safety Assessment (EBP-NOK PSA) Study	Galeri Reaktor, Blok 20 Agensi Nuklear Malaysia	Antarabangsa
		Mesyuarat APEC-ISTWG ke 43	Taiwan City, Chinese Taipei	Antarabangsa
		TM on Potential International Centres of Excellence Based on High Flux Research Reactor Facilities	CAE, Cadarache	Antarabangsa
12	KOK KUAN YING, DR	External Peer Reviewer bagi Cadangan Projek dari Swinburne University of Technology Sarawak	Swinburne U. of Technology Sarawak	Kebangsaan
		Jawatankuasa Pemilihan kertaskerja terbaik RND seminar 2012	Nuklear Malaysia	Agensi

BIL *NO*	NAMA *NAME*	TAJUK / BUTIRAN AKTIVITI *TOPIC / ACTIVITIES*	TEMPAT *VENUE*	PERINGKAT *LEVEL*
13	KONSOH @ JOHN KONSOH BIN SANGAU	Temuduga Bagi Pengambilan dan Lantikan Jawatan Pembantu Tadbir (Perkeranian/Operasi) Gred N17 (Sambilan) dibawah Peruntukan Amanah, Nuklear Malaysia.	Nuklear Malaysia, Kajang	Agensi
14	MAHMOOD BIN DOLLAH, DR	Ijazah Bachelor of Mechanical(eng)"NDT analysis on composite materials"	UNITEN	Kebangsaan
15	MD SUHAIMI BIN ELIAS	3RD STEERING COMMITTEE MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
16	MEOR YUSOFF BIN MEOR SULAIMAN, DR	Anugerah Inovasi Negara 2012	Bangi	Kebangsaan
		Bengkel pemantauan projek Science fund Cluster Industry	Putrajaya	Kebangsaan
		INPRO Collborative Project Meeting	Vienna	Antarabangsa
		Nuklear Malaysia R&D projects evaluation 2/2012	Nuklear Malaysia	Agensi
		Science fund Project Monitoring Core S&T - chemical sciences	Putrajaya	Kebangsaan
		Science fund Review Meeting Cluster Industry 5/2012	Putrajaya	Kebangsaan
		Science fund Review Meeting Cluster Industry 7/2012 - advanced material and polymer engineering	Putrajaya	Kebangsaan
17	MOHAMAD PAUZI BIN ISMAIL	BENGKEL PENILAIAN PERMOHONAN SCIENCEFUND KLASTER INDUSTRI	MOSTI	Kebangsaan
		Juruaudit Dalaman ISO 17025	Radiochemistry lab	Agensi
		Juruaudit Dalaman ISO 17026	SSDL	Agensi
		Penilai Pentauliahan Persijilan Kemahiran Malaysia	SIRIM, Shah Alam	Kebangsaan
		Penilai Permohonan Science fund dan PQRD	Nuklear Malaysia	Agensi
		Penilai Teknikal ISO 17020	Careion Technologist Sdn. Bhd.	Kebangsaan
18	MOHAMAD PUAD BIN HJ ABU, Ir Dr	3RD STEERING COMMITTEE MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
		Consultancy Meeting (Cs) on Emerging Nuclear Power Power in Regional Contexts: Southeast Asia	Hanoi	Antarabangsa
		Editor E-Jurnal Sains Nuklear	Agensi Nuklear malaysia	Agensi
		Jawatankuasa Hala Tuju Kejuruteraan Nuklear Nuklear Di Institusi Pengajian Tinggi (IPT)	Kementerian Pengajian Tinggi	Kebangsaan
		Jawatankuasa Kebangsaan Persijilan Pegawai Perlindungan Sinaran (JKPPPS) Lembaga Perlesanan Tenaga Atom	Lembaga Perlesanan Tenaga Atom	Kebangsaan
		Jawatankuasa Pemandu NPIDP Malaysian Nuclear Power Cooporation, Jabatan Perdana Menteri.	Malaysian Nuklear Power Cooporation	Kebangsaan
		Kick-Off Meeting on Extra-Budgetary norwegian Probability Safety Assessment (EBP-NOK PSA) Study	Galeri Reaktor, Blok 20 Agensi Nuklear Malaysia	Antarabangsa
		Mesyuarat/Bengkel Jaminan Kualiti-Latihan Kod Amalan untuk Akreditasi Program (COPPA) - (6-8 April 2012)	Hotel Armada, Petaling Jaya	Kebangsaan

BIL *NO*	NAMA *NAME*	TAJUK / BUTIRAN AKTIVITI *TOPIC / ACTIVITIES*	TEMPAT *VENUE*	PERINGKAT *LEVEL*
		Panel Penilai Agensi Kelayakan Malaysia Kejuruteraan Nuklear	Agensi Nuklear malaysia	Kebangsaan
19	MOHAMAD SAFUAN BIN SULAIMAN	Consultancy Meeting to Review the First Year Activities and Prepare a Draft Report on the CRP Increasing NPP Performance Through Process Oriented Knowledge Management Approach	Vienna	Antarabangsa
20	MOHAMMAD SUHAIMI BIN KASSIM	Mesyuarat/Bengkel Jaminan Kualiti-Latihan Kod Amalan untuk Akreditasi Program (COPPA) - (6-8 April 2012)	Hotel Armada, Petaling Jaya	Kebangsaan
21	MOHD ABD WAHAB BIN YUSOF, DR	Training Meeting on Interaction Between Technical and Social Aspects for Waste Disposal Programmes	Istanbul	Antarabangsa
22	MOHD FAUZI BIN HARIS	Anugerah Inovasi Negara 2012 Kategori Perkhidmatan	Nuklear Malaysia	Kebangsaan
23	MOHD FAZLI BIN ZAKARIA	Kick-Off Meeting on Extra-Budgetary norwegian Probability Safety Assessment (EBP-NOK PSA) Study	Galeri Reaktor, Blok 20 Agensi Nuklear Malaysia	Antarabangsa
24	MOHD JAMIL BIN HASHIM	INNOFUND MOSTI- New Revolutionary Acoustical Material Panel Using Kenaf Composite	MOSTI, Putrajaya	Kebangsaan
25	MOHD SIDEK BIN OTHMAN	Healthcare equipment sterilzation(gamma rays)	Jabatan Pembangunan Kemahiran, Kem Sumber Manusia	Kebangsaan
26	MOHD. ASHHAR BIN HJ KHALID, DR	3RD STEERING COMMITTEE MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
		TM on Evaluation Methodology of the Status of Naitonal Nuclear Infrastructure Development and Integrated Nuclear Infrastructure Review (INIR)	Vienna	Antarabangsa
27	MUHAMAD BIN LEBAI JURI, DR	13th Ministerial Meeting (FNCA)	Jakarta	Antarabangsa
		3RD STEERING COMMITTEE MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
		IAEA_Consultancy meeting in Coordinating Nuclear Power Introduction in Malaysia - IAEA Integrated Masterwork Plan(IWK) for Building the Nuclear Power	Vienna	Antarabangsa
		Meeting with Korea Atomic Energy Research Institute (KAERI) and Seoul Forum S&T	Seoul	Antarabangsa
		Persidangan Agong ke 56 Agensi Tenaga Atom Antarabangsa	Vienna	Antarabangsa
		Steering Committee on Education and Training in Radiation Protection and Waste Safety	Vienna	Antarabangsa
		The Fukushima ministerial Conference on Nuclear Safety	Fukushima Prefecture	Antarabangsa
28	MUHAMMAD RAWI BIN MOHAMED ZIN, DR	IAEA Workshop/Technical Meeting on Innovative Applications of Small Research Reactors, Small Neutron Generators and Isotopic Neutron Sources	Hong Kong	Antarabangsa

BIL *NO*	NAMA *NAME*	TAJUK / BUTIRAN AKTIVITI *TOPIC / ACTIVITIES*	TEMPAT *VENUE*	PERINGKAT *LEVEL*
29	MUHD NOOR BIN MUHD YUNUS, DR	13th FNCA Coordinators Meeting dan Specialist Meeting on Mo-99 Production by (n, gamma) Method	Fukui dan Tokyo	Antarabangsa
		13th Ministerial Meeting (FNCA)	Jakarta	Antarabangsa
		3RD STEERING COMMITTEE MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
		Jemputan sebagai Ahli Panel untuk Makmal Pelan Induk Program Pengajian Institusi Pendidikan	Avillion Admiral Cove, PD	Kebangsaan
30	MUNIRA BINTI SHAIKH NASIR	3RD STEERING COMMITTEE MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
31	NIK GHAZALI BIN NIK SALLEH, DR	3RD STEERING COMMITTEE MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
32	NORASALWA BINTI ZAKARIA, DR	3RD STEERING COMMITTEE MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
		Penilaian Teknologi Pengurusan Sisa Pepejal Kebangsaan Standard Kemahiran Pekerjaan	Putrajaya	Kebangsaan
		Kebangsaan bagi Pakej 018-Solid Waste	Malaysia	Kebangsaan
33	NORIAH BINTI JAMAL, DR	Asia and the Pacific National Liaison Officer (NLO) Meeting	Vienna	Antarabangsa
		IAEA_Consultancy meeting in Coordinating Nuclear Power Introduction in Malaysia - IAEA Integrated Masterwork Plan(IWK) for Building the Nuclear Power	Vienna	Antarabangsa
		Mesyuarat Persediaan Ketiga Peringkat Sherpa Bagi Siadng Kemuncak Keselamatan Nuklear 2012	New Delhi	Antarabangsa
		Mesyuarat Pertama Peringkat SHERPA Bagi Sidang Kemuncak Mengenai Keselamatan Nuklear 2014	Istambul	Antarabangsa
		Persidangan Agong ke 56 Agensi Tenaga Atom Antarabangsa	Vienna	Antarabangsa
		Regional Project First Coordination Meeting on Supporting Decision Making for Nuclear Power Planning and Development	Beijing	Antarabangsa
34	PAULINE LIEW WOAN YING	31ST SIMPOSIUM OF THE MALAYSIAN SOCIETY FOR MICROBIOLOGY 3RD STEERING COMMITTEE	Kota Kinabalu, Sabah	Kebangsaan
35	RABIAH BINTI ABU HASSAN	MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
		Annual Meeting of the Education and Training Topical Group (ETTG) and Regional Workshop on the Development to Embark on Nuclear Power Program	Vienna	Antarabangsa
36	RUSLI BIN IBRAHIM, DR	Lawatan Saintifik Advanced Mutation and Molecular Breeding for Enhanced and Sustainable Rice Production (IAEA TC Project MAL5029)	Beijing	Antarabangsa

BIL *NO*	NAMA *NAME*	TAJUK / BUTIRAN AKTIVITI *TOPIC / ACTIVITIES*	TEMPAT *VENUE*	PERINGKAT *LEVEL*
37	SALMAH BINTI MOOSA	1st Regional Coordination Meeting on Enhancing Productivity of Locally Underused Crops Through Dissemination of Mutated Germplasm and Evaluation of Soil Nutrient and Water Management Practices (RAS5064) - Rapporteur.	Malaysian Nuclear Agency.	Antarabangsa
		Jawatankuasa Rundingan Harga Bagi Perolehan Perkhidmatan Penyenggaraan Gas Chromatography Mass Spectrometer (GCMS) oleh Jabatan Kimia	Jabatan Kimia,Malaysia.	Kebangsaan
		Jawatankuasa Rundingan Harga Bagi Perolehan Perkhidmatan Penyenggaraan Ion Chromatography (IC DIONEX) oleh Jabatan Kimia. Jawatankuasa Rundingan Harga	Jabatan Kimia,Malaysia.	Kebangsaan
		Bagi Perolehan Perkhidmatan Penyenggaraan Liquid Chromatography Mass Spectrometer (LCMS) oleh Jabatan Kimia Seminar R&D Nuklear Malaysia	Jabatan Kimia,Malaysia.	Kebangsaan
38	SHAFII BIN KHAMIS, DR	TechnoFund MOSTI	Agensi Nuklear malaysia	Agensi
		Bengkel Kertas Soalan Penguji	MOSTI, Putrajaya	Kebangsaan
39	SHAHARUDIN SAYUTI	Zarah Magnet dan Penguji Penembus Cecair Tahap 1 Bengkel Kertas Soalan Peperiksaan	Jabatan Pembangunan Kemahiran (JPK), Cyberjaya	Kebangsaan
		Jururadiograf Industri - Binaan Berkimpalan Bengkel Pemantapan Sistem	Jabatan Pembangunan Kemahiran (JPK), Cyberjaya	Kebangsaan
		Persijilan Kemahiran Malaysia(SPKM) NDT Bengkel Penyelarasan	Jabatan Pembangunan Kemahiran (JPK), Port Dickson	Kebangsaan
		Pelaksanaan Persijilan Kemahiran Malaysia (Bidang Radiografi Industri) Panel Penilai Pakar untuk Penilaian	Jabatan Pembangunan Kemahiran (JPK), Cyberjaya	Kebangsaan
40	SHAHARUM BIN RAMLI	Pembiayaan Dana R,D&C Kementerian Sains, Teknologi dan Inovasi Technical Meeting on Implementing	Putrajaya	Kebangsaan
		Knowledge Management in Integrated Management Systems of Nuclear Organizations Interregional Training Course on	Vienna	Antarabangsa
41	SHERIFFAH NOOR KHAMSEAH AL-IDID BINTI SYED AHMAD IDID	Nuclear Power Plant(NPP): Contracting, Pre-Construction, Construction and Management Seminar R&D Nuklear Malaysia	Beijing and Ningde	Antarabangsa
42	SITI A IASAH BINTI HASHIM	Anugerah Inovasi Negara 2012	Nuklear Malaysia	Agensi
43	SITI NURBAHYAH HAMDAN	Kategori Perkhidmatan 3RD STEERING COMMITTEE	Kuala Lumpur	Kebangsaan
44	TAIMAN BIN KADNI	MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA Penilai Project Technofund MOSTI	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
45	WAN SAFFIEY BIN WAN ABDULLAH (DR)	Peperiksaan konfrensif pelajar PhD	MOSTI	Kebangsaan
		- Ms Maryam Erfani Hiagiri (Gs25982)	UPM, Serdang	Kebangsaan
		Peperiksaan konfrensif pelajar PhD - Ms Nasrin Khalilzadeh (Gs26722)	UPM, Serdang	Kebangsaan

BIL *NO*	NAMA *NAME*	TAJUK / BUTIRAN AKTIVITI *TOPIC / ACTIVITIES*	TEMPAT *VENUE*	PERINGKAT *LEVEL*
		Temuduga calon Biasiswa Yang Dipertuaqn Agong, JPA @ Calon pasca-siswazah (PhD & MSc)	JPA	Kebangsaan
46	WEE BOON SIONG, DR.	R&D Project Evaluation	Bangi	Agensi
47 **48**	ZAIFOL BIN SAMSU	3RD STEERING COMMITTEE MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
49	ZAKARIA BIN TAIB	3RD STEERING COMMITTEE MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
		CS on Development of Technical and Professional Human Resources for new Nuclear Power Programmes	Texas A&M University, Austin	Antarabangsa
	ZARINA BINTI MASOOD, DATIN	FNCA Safety Management Systems Peer Review and Workshop	Daejeon	Antarabangsa
		IAEA Consultancy Meeting on PErvasive Computing Embedded Systems Middleware(PECES) Draft Document	Vienna	Antarabangsa
		Perbincangan Rundingan Kemudahan Nuklear-Rangkakerja Perundangan	AELB	Kebangsaan
50	ASSRI BIN RAMLI	Perbincangan Rundingan Kemudahan Nuklear-Rangkakerja Perundangan	AELB	Kebangsaan
51	AFFRIDA BINTI ABU HASSAN	Eksperimen Penyinaran Sampel Tumbuhan Menggunakan Alur Ion di bawah Projek Bilateral Nuklear Malaysia-JAEA Generating New Ornamental Plant Varieties Using Ion Beams	Takasaki	Antarabangsa
52	AHMAD RAZALI B. ISMAIL	Kick-Off Meeting on Extra-Budgetary norwegian Probability Safety Assessment (EBP-NOK PSA) Study	Galeri Reaktor, Blok 20 Agensi Nuklear Malaysia	Antarabangsa
53	ALAWIAH BINTI MUSA	THE COMPREHENSIVE NUCLEAR TEST-BAN TREATY (CTBT) THIRTY-EIGHTH SESSION OF WORKING GROUP B	Vienna	Antarabangsa
54	ANDY KONG SHIN SHYEN	3RD STEERING COMMITTEE MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
55	AZHAR BIN MOHAMAD, DR	RAS5064 - IAEA First Coordination Meeting	Kuala Lumpur	Antarabangsa
56	AZIMAWATI BINTI AHMAD	Perbincangan Rundingan Kemudahan Nuklear-Rangkakerja Perundangan	AELB	Kebangsaan
57	BASHILLAH BINTI BAHARUDDIN	THE COMPREHENSIVE NUCLEAR TEST-BAN TREATY (CTBT) THIRTY-EIGHTH SESSION OF WORKING GROUP B	Vienna	Antarabangsa
58	DAHLAN BIN HJ MOHD, DR	Persidangan Agong ke 56 Agensi Tenaga Atom Antarabangsa	Vienna	Antarabangsa
59	FAIRUZ SUZANA BINTI MOHD CHACULI	3RD STEERING COMMITTEE MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
60		IAEA Training Meeting/Workshop for Teacher Training on the IAEAs Analytical Tools for Elaborating Sustainable Energy Strategies	Vienna	Antarabangsa

BIL *NO*	NAMA *NAME*	TAJUK / BUTIRAN AKTIVITI *TOPIC / ACTIVITIES*	TEMPAT *VENUE*	PERINGKAT *LEVEL*
61	ISHAK BIN MANAF, DR	3RD STEERING COMMITTEE MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
		IAEA Technical Meeting/Workshop on Topical Issues on Nuclear Infrastructure Development: Managing the Development of a National Infrastructure for Nuclear Power Plants	Vienna	Antarabangsa
62	JAAFAR BIN ABDULLAH, DR	3rd Research Coordination Meeting on Application of Large Sample Neutron Activation Analysis Techniques for Inhomogeneous Bulk Archaeological Samples and Large Objects (IAEA CRP MAL-15359)	Lima	Antarabangsa
63	JAMAL KHAER BIN IBRAHIM	IAEA_Consultancy meeting in Coordinating Nuclear Power Introduction in Malaysia - IAEA Integrated Masterwork Plan(IWK) for Building the Nuclear Power	Vienna	Antarabangsa
64	KAMARUDDIN BIN HASHIM, DR	FNCA 2012 Workshop on Radiation Processing of Natural Polymers	Institute of Nuclear Physics, Almaty	Antarabangsa
		IAEA/RCA Final Progress Review Meeting of RAS/8/109 combining with Project Planning Meeting of RAS/1/014	Jakarta	Antarabangsa
		Panel Seminar on Undergraduate Research Project	UMP	Kebangsaan
		Seminar on Undergraduate Research Project, Universiti Malaysia Pahang, 16 – 17hb Januari 2012	UMP	Kebangsaan
65	KHAIRUDDIN BIN MOHAMAD KONTOL	Perbincangan Rundingan Kemudahan Nuklear-Rangkakerja Perundangan	AELB	Kebangsaan
		TM on Technical Support Organization (TSO) Oversight	Vienna	Antarabangsa
66	MAZLEHA BINTI MASKIN	Kick-Off Meeting on Extra-Budgetary norwegian Probability Safety Assessment (EBP-NOK PSA) Study	Galeri Reaktor, Blok 20 Agensi Nuklear Malaysia	Antarabangsa
		Norwegian Extrabudgetary Programme on Strenghthening Nuclear Safety Competence in Developing Country: Joint Essential Knowledge Workshop: Evaluation of the Safety Analysis Report	Movenpick Hotel, Hanoi,	Antarabangsa
67	MOHD AZMI BIN SIDID OMAR	Regional Meeting on Successful Launching of Nuclear Power Programmes	Seoul	Antarabangsa
68	MOHD RIZAL BIN MAMAT @ IBRAHIM	3RD STEERING COMMITTEE MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
		Norwegian Extrabudgetary Programme on Strenghthening Nuclear Safety Competence in Developing Country: Joint Essential Knowledge Workshop: Evaluation of the Safety Analysis Report	Movenpick Hotel, Hanoi,	Antarabangsa
69	MOHD RODZI BIN ALI, Dr.	Technical Meeting on Strengthening of Biological Dosimetry in IAEA Member State	Vienna	Antarabangsa

BIL *NO*	NAMA *NAME*	TAJUK / BUTIRAN AKTIVITI *TOPIC / ACTIVITIES*	TEMPAT *VENUE*	PERINGKAT *LEVEL*
70	MOHD ZAIDI BIN IBRAHIM,DR	Technical Meeting of DISPONET	Soulaines-Dhuys	Antarabangsa
71	MOHD ZAKI UMAR	Jawatankuasa Mesyuarat Ujian NDT, Jabatan Pembangunan Kemahiran, Kementerian Sumber Manusia.	Putrajaya	
72	MUHAMMAD HUSAMUDDIN BIN ABDUL KHALIL	TM on Cost Estimation for Decommissioning	Vienna	Kebangsaan
73	NAZARATUL ASHIFA BINTI ABDULLAH	3RD STEERING COMMITTEE MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
74	NIK MARZUKEE BIN NIK IBRAHIM	3RD STEERING COMMITTEE MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
75	NORFAIZAL BIN MOHAMED @ MUHAM-MAD	3RD STEERING COMMITTEE MEETING BETWEEN JAEA AND NUCLEAR MALAYSIA	BILIK PERSIDANGAN, BLOK 11	Antarabangsa
76	PHONGSAKORN A/L PRAK TOM	Kick-Off Meeting on Extra-Budgetary norwegian Probability Safety Assessment (EBP-NOK PSA) Study	Galeri Reaktor, Blok 20 Agensi Nuklear Malaysia	Antarabangsa
		Norwegian Extrabudgetary Programme on Strenghthening Nuclear Safety Competence in Developing Country: Joint Essential Knowledge Workshop: Evaluation of the Safety Analysis Report	Movenpick Hotel, Hanoi,	Antarabangsa
77	RAHMAN BIN YACCUP	RCA Project Pllaning and Coordination Meeting on Supporting Nuclear and Isotopic Techniques to Assess Climate Change for Sustainable Marine Ecosystem Management	IAEA HQ Vienna	Antarabangsa
78	RAJA JAMAL BIN RAJA HEDAR	Asia and the Pacific National Liaison Officer (NLO) Meeting	Vienna	Antarabangsa
		The 34th RCA National Representatives Meeting and The 40th Annivesary of RCA Exhibition	Beijing	Antarabangsa
79	RIDZUAN BIN ABDUL MUTALIB	Kick-Off Meeting on Extra-Budgetary norwegian Probability Safety Assessment (EBP-NOK PSA) Study	Galeri Reaktor, Blok 20 Agensi Nuklear Malaysia	Antarabangsa
80	ROSLAN BIN YAHYA	3rd Research Coordination Meeting on Application of Large Sample Neutron Activation Analysis Techniques for Inhomogeneous Bulk Archaeological Samples and Large Objects (IAEA CRP MAL-15359)	Lima	Antarabangsa
81	SHAFAAI BIN HASSAN	Meeting on Supporting Nuclear Education and Training through e-Learning	Vienna	Antarabangsa
82	TONNY ANAK LANYAU	Kick-Off Meeting on Extra-Budgetary norwegian Probability Safety Assessment (EBP-NOK PSA) Study	Galeri Reaktor, Blok 20 Agensi Nuklear Malaysia	Antarabangsa
		Norwegian Extrabudgetary Programme on Strenghthening Nuclear Safety Competence in Developing Country: Joint Essential Knowledge Workshop: Evaluation of the Safety Analysis Report	Movenpick Hotel, Hanoi,	Antarabangsa

BIL *NO*	NAMA *NAME*	TAJUK / BUTIRAN AKTIVITI *TOPIC / ACTIVITIES*	TEMPAT *VENUE*	PERINGKAT *LEVEL*
83	WAN ZAKARIA BIN WAN MUHAMAD TAHIR, DR	IAEA/RCA Initial Project Coordination Meeting on Isotope Techniques to Inventigate Groundwater Dynamics and Recharge Rate for Sustainable Groundwater Resource Management	Vienna	Antarabangsa
84	ZAINUDIN BIN OTHMAN, DR	First Coordination Meeting of Project RAS 5.055 : Improving Soil Fertility, Land Productivity and Land Degration Mitigation (RCA)	Colombo	Antarabangsa
85	ZAITON BINTI AHMAD, DR	JAEA-Nuclear Malaysia Bilateral Project-Ion Beam Irradiation of Ornamental Plants	Takasaki	Antarabangsa

16. Pengurusan Kewangan

16. Financial Management

16.1 Prestasi Kewangan

Tiga sumber peruntukan kewangan utama dari Kerajaan telah diterima oleh Nuklear Malaysia iaitu Belanjawan Mengurus, Belanjawan Pembangunan dan Peruntukan Akaun Amanah. Dana Akaun Amanah merupakan peruntukan yang diterima dari bayaran khidmat teknikal, perundingan, latihan dan jualan produk Nuklear Malaysia

Peruntukan mengurus yang diterima pada 2012 berjumlah RM70.67 juta. Prestasi perbelanjaan peruntukan ini ialah 99.39 % dengan nilai keseluruhan RM70.24 juta. Sejumlah RM9.16 juta peruntukan pembangunan diterima pada tahun ini. Peruntukan ini pula mencatat prestasi perbelanjaan sebanyak 95.58% bernilai RM9.02 juta. Pengurusan Akaun Amanah telah meluluskan peruntukan sebanyak RM 34.16 juta bagi pembiayaan pelbagai operasi komersil agensi. Prestasi perbelanjaan yang dicatatkan ialah 37.76% dengan nilai RM12.9.

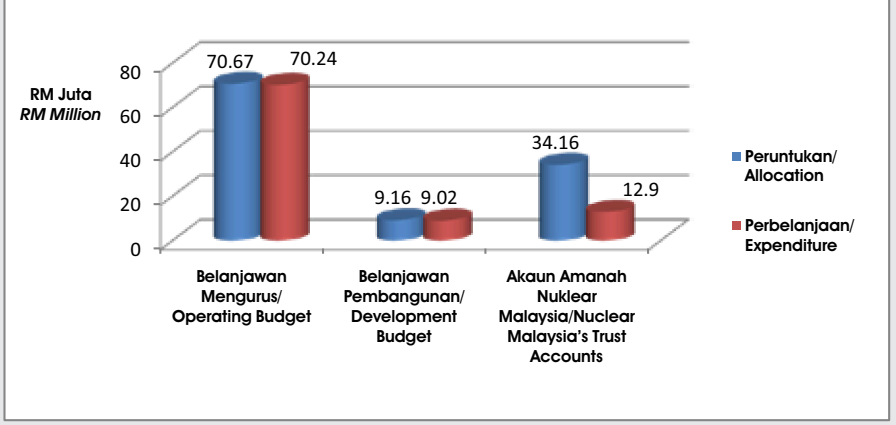
16.1 Financial Performance

Nuclear Malaysia received three financial allocations from the government namely Operating Budget, Development Budget and Trust Accounts Allocation. Trust Account fund came from charges for technical services, consultancy, training and sales of product.

In 2012, Nuclear Malaysia received RM70.67 million for operating budget. Expenditure was at 99.39% amounting to RM70.24 million. An amount of RM9.06 million was allocated for Development Budget of which 95.58 %, amounting to RM9.02 million has been spent. The Trust Fund Committee has approved an allocation of RM 34.16 million for funding of operation of commercial activities throughout the year. A total of RM12.9 which is 37.76% has been spent.

Jadual 16.1 : Prestasi Kewangan 2012
Table 16.1 : 2012 Financial Performance

Sumber Peruntukan ***Allocation Sources***	**Peruntukan (RM juta)** ***Allocation (RM million)***	**Perbelanjaan (RM juta)** ***Expenditure (RM million)***	**Prestasi Perbelanjaan** ***Expenditure Performance***
Belanjawan Mengurus *Operating Budget*	70,667,155.00	70,238.543.26	99.39%
Belanjawan Pembangunan *Development Budget*	9,155,000.00	9,024,794.13	98.58%
Akaun Amanah Nuklear Malaysia *Trust Account Allocation*	34,157,286.72	12,896,568.05	37.76%



Rajah 16.1 : Prestasi kewangan 2012
Figure 16.1 : 2012 Financial Performance

17. Senarai Penerbitan

17. List Of Publications

BUKU / *BOOK*

Omar, M. (2012), 'Bahan radioaktif tabii. bahan radioaktif tabii', Agensi Nuklear Malaysia .

BAB DALAM BUKU
CHAPTER IN BOOK

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b Ahueb, M. I., Dahlan, K. Z. H. M. & Sulaiman, H. (2012), 'Effect of electron beam on the mechanical and thermal properties of copper filter-reinforced nylon 66 composites', *Journal of Mechanics Engineering and Automation.Manuscripts* .

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