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WAWASAN • MISI • OBJEKTIF

VISION • MISSION • OBJECTIVES

VISI

Sains dan teknologi nuklear untuk penjaan ilmu, kemakmuran dan kesejahteraan masyarakat dan negara

VISION

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

MISI

Meneraju kecemerlangan dalam penyelidikan dan penggunaan teknologi nuklear untuk pembangunan lestari

MISSION

Excellence in research and applications of nuclear technology for sustainable development

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 komersilisasi teknologi
- Meningkatkan kecemerlangan organisasi melalui perancangan dan pengurusan kualiti

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

Kemampuan dalam menguasai teknologi termaju melalui ekonomi baru berasaskan S&T serta inovasi akan memacu usaha ke arah mencapai status negara maju. Justeru, peningkatan daya saing negara dapat diperkasakan melalui penghasilan output R&D berkualiti, dijana oleh modal insan yang kompeten, kreatif dan berinovasi serta disokong dengan infrastruktur dan infostruktur yang lengkap dan kondusif. Konsep *brain gain* termasuk menggalakkan kepulangan saintis yang bertugas di luar negara dan pertukaran maklumat dan idea adalah antara mekanisme bagi menjana modal insan dalam S&T yang kompeten, kreatif dan inovatif. Ekonomi baru berasaskan S&T dan inovasi juga memastikan peningkatan kemasukan FDI, dan dalam merebut peluang pasaran global melalui penghasilan output R&D baru atau output bernilai tambah baru yang berkualiti. Pencapaian ini berlaku melalui perancangan yang rapi, berkesan dan berstrategik.

Penemuan saintifik yang signifikan dan penting hanya dapat dijana melalui usaha-usaha jitu R&D berinovasi, kebanyakannya tercapai melalui jalinan kerjasama dengan saintis dalam dan luar negara. Kerjasama yang termeterai dengan pelbagai agensi dalam dan luar negara khususnya dalam penyelidikan, pemindahan teknologi dan latihan adalah antara kekuatan Nuklear Malaysia yang boleh dimanfaatkan sepenuhnya bagi memacu usaha

The capacity to acquire new economy based on S&T and innovation would provide impetus to propel the nation toward a developed status. The enhancement of the nation's competency is strengthened through innovative R&D in generating quality products as well as creative and innovative human capital supported by adequate and conducive infra- as well as info-structure. The brain gain concept, including encouraging the return back of scientists working overseas and exchange of information and ideas are typical mechanism to generate competent, creative and innovative human capital in R&D. The new economy based on S&T and innovation will also assure the nation's competency in facing a challenging global economy through production of new quality output or new value added R&D output. The achievement is accomplished through proper, effective and strategic planning.

Important and significant scientific discovery is generated only through precise and innovative R&D, mostly achieved through research network with local and foreign scientists. Collaborative agreement and understanding with various local and foreign agencies especially in undertaking research, technology transfer and training is amongst the strength of this agency that should be fully benefited to enhance efforts in generating world class R&D output. The socioeconomic impact is a direct outcome of R&D activities

penghasilan output R&D bertaraf dunia. Peningkatan sosioekonomi adalah impak langsung aktiviti R&D kepada negara melalui bantuan kepada industri-industri terutama industri kecil dan sederhana. Pelaksanaan dibuat antaranya melalui pemindahan teknologi dan khidmat kepakaran supaya selaras dengan hasrat negara mempertingkat dan memperkembangkan ekonomi baru melalui hasil R&D, pembangunan modal insan dan harta intelek serta mengurangkan jurang pengetahuan.

Pengalaman 35 tahun dalam pelbagai S&T nuklear bukan penjaan kuasa, serta 25 tahun dalam pengendalian reaktor nuklear penyelidikan yang bebas kemalangan radiologi dan bersih alam sekitar, menjadi antara fakta pengukur kemampuan Nuklear Malaysia dalam menguasai teknologi ini untuk penjaan ilmu, kemakmuran dan kesejahteraan masyarakat. Nuklear Malaysia juga terkehadapan dalam pencapaian S&T nuklear berbanding tahap pencapaian agensi nuklear di negara-negara jiran terdekat, walaupun agensi-agensi nuklear di negara jiran berkenaan telah dibangunkan lebih awal; juga menjadi tanda aras kemajuan dicapai oleh agensi nuklear negara ini. Di samping itu, Nuklear Malaysia juga telah dijadikan contoh oleh agensi-agensi nuklear di negara-negara jiran tersebut untuk dijadikan model dalam merangka pelan pelaksanaan pembangunan S&T nuklear masing-masing, terutama dalam aspek pemindahan dan pengkomersilan teknologi.

Nuklear Malaysia telah mendapatkan kemampuan dalam S&T nuklear yang membanggakan. Kemampuan ini perlu dipertingkatkan ke tahap lebih termaju supaya selari dengan perkembangan S&T nuklear di negara maju. Perancangan yang boleh direalisasikan melalui perolehan loji reaktor penyelidikan nuklear berkuasa lebih tinggi, kemudahan yang membolehkan aktiviti R&D lebih maju di bidang bukan tenaga dilaksanakan. Kemudahan tersebut juga memberi kemudahan untuk melaksanakan R&D di

to the nation through contribution to industries, in particular small and medium industries. The implementation amongst others is undertaken through technology transfer and expert services in line with the government policy to enhance and develop new economy through R&D products, human capital development and intellectual properties as well as to narrow the knowledge gap.

The 35 years of experience in various S&T in non-power nuclear application, and 25 years in operating the first nuclear research reactor, free of radiological accident, clean environment, are amongst the facts that can be used to gauge the capability of Nuclear Malaysia in acquiring the technology for knowledge generation, wealth creation and societal well being. Nuclear Malaysia is well ahead of other research institutes of neighboring nations, even though the establishment of the said nuclear research institutes is much earlier than Nuclear Malaysia, this facts can be a benchmark to evaluate the achievement of the nuclear agency. Furthermore, Nuclear Malaysia is also considered as an exemplary nuclear research organization in terms of achievement and used as model by other research institutes in the neighbouring nations especially in technology transfer and commercialization.

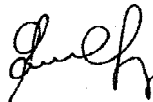
Nuclear Malaysia had acquired capability in nuclear S&T that is praiseworthy. The capability is needs to be enhanced to a more advanced technology in parallel with the development in developed nations worldwide. The plan that can be materialized through availability of higher power nuclear research reactor, to facilitate more advanced study be carried out in non-power application of nuclear technology and R&D in power application, in addition to providing facility to develop human capital for safe and effective operation of nuclear reactor power plants.

The advantage of power generation is attributed to it being more economic in operating cost, besides free gas carbon

bidang penjaan kuasa nuklear, di samping menyediakan Nuklear Malaysia untuk membangun modal insan mengendalikan reaktor nuklear penjaan kuasa dengan selamat dan berkesan.

Kelebihan penjaan kuasa nuklear adalah kos operasinya yang lebih ekonomik, di samping berciri bebas pemancaran gas karbon dioksida, iaitu bahan yang dikaitkan dengan pemanasan global. Di samping itu, kuasa nuklear juga menjadi sumber tenaga alternatif di kebanyakan negara maju kerana peningkatan berterusan harga petroleum oleh pelbagai faktor antaranya pertambahan permintaan oleh pasaran serta kepelbagaian produk petrokimia daripada petroleum. Memasyarakatkan maklumat tentang tenaga nuklear yang mesra pengguna dan alam perlu diusahakan secara berterusan bagi memenangi penerimaan awam terhadap S&T nuklear terutama dalam penjaan tenaga elektrik.

dioxide emission, a gas that is related to global warming. In addition, nuclear is an alternative source of energy for most developed nations because continuous ascendancy of petroleum price due to factors such as market demand and diversification of petrochemicals from petroleum. It is important to publicize the information about safety and security of nuclear power generation to win public acceptance of the technology.



DATO' SRI DR. JAMALUDDIN B. JARJIS
Menteri Sains, Teknologi dan Inovasi
The Minister of Science, Technology and Innovation



PERUTUSAN KETUA SETIAUSAHA KEMENTERIAN SAINS, TEKNOLOGI DAN INOVASI

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

MOSTI merancang pelbagai program bagi memastikan sains dan teknologi menjadi pemacu utama dalam pembangunan sosioekonomi negara terutamanya dalam bidang industri, keselamatan, kesihatan dan alam sekitar. Salah satu strategi bagi mencapai matlamat ini ialah dengan memperkukuh dan meningkatkan sistem penyampaian perkhidmatannya. Sistem penyampaian yang efisien adalah penting bagi memastikan kepuasan pelanggan.

Selaras dengan teras Kelima Rancangan Malaysia Kesembilan, MOSTI memastikan setiap agensinya memperkemaskan prosedur kerja serta sistem penyampaian perkhidmatan. Selain mengenal pasti sistem penambahbaikan bagi perkhidmatan yang cekap, MOSTI turut mendorong agensi di bawahnya untuk mengukuhkan perkhidmatan melalui inisiatif pengurusan kualiti.

MOSTI menggalakkan semua agensi nya memberi perkhidmatan mengikut standard antarabangsa seperti MS ISO 9001:2000, ISO 17025, EN46000 dan cGMP/FDA untuk memastikan keberkesanan sistem penyampaian perkhidmatan yang berkualiti. Nuklear Malaysia terbukti telah mengambil langkah proaktif dengan mempunyai sejumlah proses dan aktiviti yang menerima persijilan standard antarabangsa. Saya percaya proses

Various programs were planned in MOSTI to ensure science and technology is the main driver for national socioeconomic development, particularly in industry, safety, health and environment. One of the strategies to achieve this objective is by strengthening and streamlining its delivery system. An efficient delivery system is important to ensure customer and stakeholders satisfaction.

In line with the Fifth Thrust of the Ninth Malaysia Plan, MOSTI has directed all her agencies to streamline their work procedures and simplify their delivery systems. Besides identifying efficient enhanced systems, MOSTI also encourages its agencies to streamline and strengthen their services through quality management initiatives.

MOSTI encourages every agency under her to provide international standard services in accordance with MS ISO 9001:2000, ISO 17025, EN46000 and cGMP/FDA to ensure effective and quality delivery systems. Nuclear Malaysia has taken proactive measures resulting on number of international standard certificates being awarded for her processes and activities. I believe efforts are being aggressively taken by Nuclear Malaysia to increase the number of processes with standards certification especially in occupational safety, health and environmental aspects. I understand that Nuclear Malaysia is now in the process of finalizing the Integrated Management System (IMS), in support of a Total Quality Management (TQM). MOSTI

mempertingkatkan kualiti boleh dipergiatkan lagi di Nuklear Malaysia agar proses yang masih belum menerima persijilan terutamanya bagi persijilan standard antarabangsa dalam aspek keselamatan dan kesihatan pekerjaan serta alam sekitar dapat dicapai. Saya difahamkan bahawa Nuklear Malaysia kini sedang dalam proses bagi menyiapkan Sistem Pengurusan Bersepadu (IMS) bagi mencapai Pengurusan Kualiti Menyeluruh (TQM).

MOSTI juga memastikan implementasi aktiviti projek R&D dapat dilaksanakan dengan sistematik bagi menjamin pencapaian objektif projek agar selari dengan visi dan misi Kementerian. Selain perancangan yang strategik, pemantauan dan penilaian juga perlu dilaksanakan melalui pengukuran prestasi berasaskan Petunjuk Prestasi Utama (KPI). Saya yakin Nuklear Malaysia juga melaksanakan proses pemantauan dalaman yang komprehensif bagi memastikan setiap projek R&D mencapai matlamatnya.-

Saya yakin dengan pengalaman selama 35 tahun, Nuklear Malaysia mampu menyahut cabaran yang lebih besar seperti menyumbang kepakaran dalam menangani isu global terutamanya krisis sumber tenaga dan isu perubahan cuaca dunia.

ensures that the implementation of its R&D activities had been carried out systematically to guarantee the objectives of the projects are achieved in line with the ministry's vision and mission. Apart from good planning, monitoring and evaluation are also undertaken through Key Performance Indicators (KPI).

I am confident that Nuclear Malaysia also implements comprehensive internal monitoring to ascertain all R&D projects achieve their goals. I am also confident that with its 35 years of experience, Nuclear Malaysia would be capable of meeting bigger challenges especially in contributing expertise to handle global issues such as the energy crisis and global climate change. such as the energy crisis and global climate change.



DATO' ABDUL HANAN BIN ALANG ENDUT
Ketua Setiausaha
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The Secretary General
Ministry of Science, Technology and Innovation



LAPORAN KETUA PENGARAH

REPORT OF THE DIRECTOR GENERAL

Meneruskan tradisi menyemarakkan penggunaan teknologi nuklear untuk pembangunan negara, pelaksanaan aktiviti sepanjang tahun 2007 menunjukkan kesungguhan Nuklear Malaysia mencapai hasrat menjana ilmu, mewujudkan kemakmuran dan kesejahteraan masyarakat. Atas sebab itulah Nuklear Malaysia terus beriltizam untuk memastikan setiap petunjuk prestasi utama (KPI) dapat ditangani bagi mencapai sasaran kerja tahunan (SKT) yang ditetapkan.

Pemacu utama yang menyumbang kepada pencapaian SKT tahun 2007 adalah kualiti modal insan dan kemudahan prasarana, di samping usaha tegas memantapkan pengurusan kualiti dan amalan keselamatan. Pada tahun 2007, Nuklear Malaysia masih lagi berada pada tahap melaksanakan dengan tekun rancangan yang telah dikenal pasti dalam RMK-9, dan pada tahun ini juga Nuklear Malaysia menyambut ulang tahun 35 tahun penubuhannya. Pertambahan aktiviti dalam penyelidikan dan pembangunan (R&D), pengkomersilan teknologi, perkhidmatan teknikal, perkhidmatan pengurusan, pembangunan modal insan, serta perancangan dan persediaan kuasa nuklear menuntut warga kerja Nuklear Malaysia melengkapkan diri dengan pengetahuan dan perkembangan supaya usaha-usaha yang dirancang dapat dijayakan.

Prestasi baik tahun 2007 diperoleh melalui inisiatif dan usaha bersungguh-sungguh yang telah diambil bagi

The activities in 2007 reflected our tradition and determination in enhancing the application of nuclear technology for national development for knowledge generation, wealth creation and societal well-being. It is for this reason that Nuclear Malaysia continues its commitment to ensure every key performance indicator (KPI) is properly addressed to achieve the annual work target (SKT).

The main contributors to this achievement are the quality of human capital and infrastructure facilities, in addition to efforts taken for a sound quality management and safety practices. In 2007, we were still in the midst of implementing the planned activities under Ninth Malaysia Plan (9MP) and celebrating 35 years existence of Nuclear Malaysia. The increasing R&D activities, technology commercialization, technical services, management services, human capital development, and nuclear power planning and preparedness demand its personnel to equip themselves with necessary knowledge and development.

The good performance in 2007 was achieved through initiatives and tireless efforts of its personnel to strengthen the core programmes apart from implementing new activities. The ability of human capital and operational standards have been improved, thus contributing to the success and sustainable expansion. The same goes to

memperkasa aktiviti teras, di samping melaksanakan aktiviti baru. Kemampuan modal insan dan standard operasi telah dapat ditingkatkan, menyumbang kepada kejayaan dan perkembangan lestari. Begitu juga dengan prestasi perkhidmatan bagi semua aktiviti dalam usaha menyampaikan standard kualiti yang tinggi kepada stakeholder. Persekitaran kerja yang selamat dan kondusif sentiasa dititikberatkan bagi menggalakkan prestasi cemerlang warga kerja untuk mencapai objektif organisasi. Nilai-nilai murni dalam kalangan warga kerja terus dipupuk untuk melahirkan semangat kekitaan dan kecintaan kepada organisasi.

Penyelidikan dan Pembangunan Teknologi

Sesuai dengan landskap sains dan teknologi negara, kegiatan-kegiatan R&D telah ditumpukan kepada bidang arus perdana seperti yang digariskan kerajaan, supaya organisasi terus relevan dan kewujudannya menjadi penting pada masyarakat. Aktiviti yang dijalankan adalah berorientasikan pasaran dan keperluan strategik bagi meningkatkan kemampuan, daya tahan dan daya saing negara di peringkat tempatan dan antarabangsa. Dalam konteks ini, penekanan utama aktiviti R&D ialah penggunaan teknologi nuklear menjurus kepada pencapaian objektif sosioekonomi berkaitan dengan bidang industri, bahan termaju, perubatan, alam sekitar, pertanian, teknologi maklumat dan komunikasi, bioteknologi dan sumber tenaga alternatif.

Pemantauan projek R&D telah dibuat secara sistematik bermula dari peringkat cadangan sehingga tamat bagi memastikan kelancaran pelaksanaan dan kejayaan sesuatu projek yang dijalankan. Kejayaan R&D telah diukur melalui penetapan KPI merangkumi jumlah output, geran, paten dan penerbitan. Pertambahan jumlah peruntukan yang diperoleh pada 2007 menunjukkan keyakinan

the service performance standard for all activities in an effort to deliver high standard quality to the stakeholders. A safe and conducive working environment has been emphasised to promote excellent performance in achieving the objectives of the organisation. These noble values need to be further nurtured to generate the spirit of teamwork and love to the organisation.

Research and Development (R&D)

In line with the national science and technology landscape, R&D activities have been focused on the mainstream fields as outlined by the government, so that the organisation stays relevant and its existence is felt. The activities are based on market and strategic needs to enhance the capability, competitiveness and sustainability of products in the local and global arena. In this context, the emphasis of R&D activities is on the application of nuclear technology for the achievement of socioeconomic objectives related to industry, advanced material, medical, environment, agriculture, information and communication technology, biotechnology and alternative energy.

To ensure smooth implementation and fruitful results, the monitoring of R&D projects was done systematically starting from project proposal until its completion. The success of R&D has been determined through agreed KPI such as total output, grant, patent and publication. The increased R&D allocation in 2007 shows the confidence of fund providers on the technical skills and expertise of Nuclear Malaysia's researchers to undertake potential projects.

R&D products, discoveries and technological innovations have been showcased in several technology expositions at national and international levels. Some technology innovations have been gaining acceptance and have received several awards. The approach of 'mentor-mentee',

pengurus dana kepada kepakaran dan kemampuan teknikal para penyelidik Nuklear Malaysia untuk menjalankan projek R&D berpotensi.

Hasil dan penemuan R&D serta inovasi teknologi telah diperagakan di beberapa ekspo dan pameran teknologi di peringkat kebangsaan dan antarabangsa. Beberapa inovasi teknologi telah berjaya menempa nama dan meraih pelbagai anugerah. Pendekatan mentor-mentee, kerja berpasukan dan integriti adalah antara nilai-nilai teras yang terus dipupuk melalui pelbagai aktiviti meliputi latihan, penghargaan dan insentif-insentif lain untuk meningkatkan minat dan kelangsungan R&D.

Pengkomersilan Teknologi

Hasil-hasil R&D yang berpotensi telah diketengahkan ke dalam pasaran sebagai usaha memanfaatkan penemuan dan inovasi saintifik kepada masyarakat dan stakeholder Nuklear Malaysia. Usaha telah dijalankan bagi mempromosi hasil tersebut di samping mengenal pasti rakan niaga daripada syarikat berpotensi dalam kalangan industri kecil dan sederhana (IKS). Supaya perkhidmatan yang diberikan kepada pelanggan lebih responsif dan sistem penyampaian dapat ditingkatkan, aktiviti komersil diuruskan oleh 23 pusat khidmat menjurus kepada sektor khidmat masing-masing. Sementara itu usaha peningkatan keupayaan teknologi terus diterokai untuk membolehkan produk R&D terus berdaya maju dan kompetitif dalam pasaran. Dalam hal ini sejumlah hampir RM3.5juta geran TechnoFund telah berjaya diperoleh daripada Kementerian Sains, Teknologi dan Inovasi bagi menjalankan projek kerjasama dengan syarikat dalam kalangan IKS terpilih.

Sebagai menyahut seruan kerajaan membantu mengukuhkan syarikat-syarikat IKS, aktiviti latihan dan pembangunan teknousahawan telah digiatkan. Aktiviti ini

teamwork and integrity are among the good values nurtured through various activities including training, appreciation and other forms of incentives to encourage interest and continuity of R&D.

Commercialisation of Technology

R&D products with good potential have been introduced into the market in an effort to share discoveries and scientific innovations to the society and stakeholders. Promotional activities for market acceptance have been geared up, besides identification of potential business partners from amongst the small and medium scale industries (SMI). In ensuring responsive and good delivery system, the existing 23 Nuclear Malaysia service centres were given the responsibilities to manage their own respective service centre. At the same time, technology up-scaling is continuously been carried out to provide more competitive and sustainable R&D products in the marketplace. In this regard, a sum of approximately RM3.5mil of MOSTI TechnoFund has been granted to implement projects in collaboration with selected SMIs.

In response to the government's call to assist in the strengthening SMIs, training and technopreneurs development activities have been mobilized, which involved training, working visit, product exhibition and technical advice to SMIs. In 2007, various training courses were conducted, in addition to 20 working visits and 4 technical consultancies to address this need. A sum of RM198, 590.00 were spent through Smidec grant in the Skills Advancement Programme that attracted 175 participants from 81 SMI companies.

The promotional activities have resulted in an increase in number of clients and the improvement of revenue. In term of clients, the number has increased 28% while the revenue

melibatkan pengendalian latihan, lawatan kerja, pameran produk dan nasihat teknikal kepada IKS. Sejumlah RM198,590.00 geran Smidec telah dibelanjakan bagi program latihan Peningkatan Kemahiran IKS melibatkan 175 peserta dari 81 syarikat IKS. Bagi tujuan ini pelbagai latihan telah dijalankan, sementara 20 syarikat telah dilawati dan 4 rundingan industri telah diadakan.

Hasil kegiatan promosi teknologi yang dijalankan telah menampakkan kesan ketara kepada jumlah pelanggan dan pulangan pendapatan. Bilangan pelanggan telah bertambah sebanyak 28%, manakala jumlah pendapatan yang dijanakan adalah kira-kira RM21.1 juta, menokok 40% kepada jumlah pada tahun sebelumnya. Pencapaian ini adalah kira-kira 27% daripada jumlah belanja mengurus Nuklear Malaysia. Dianggarkan kira-kira 80% pelanggan adalah dari sektor swasta dengan komponen utamanya terdiri daripada kalangan IKS.

Perkhidmatan Teknikal

Aktiviti ini merupakan kegiatan sokongan bagi merangsang pertumbuhan organik Nuklear Malaysia dalam melaksanakan penyelidikan, pembangunan fizikal, penyenggaraan prasarana dan peralatan serta khidmat pengurusan. Usaha ini berkait rapat dengan keberkesanan, kecekapan dan impak tempat kerja kondusif kepada aras prestasi warga kerja Nuklear Malaysia. Aspek keselamatan dan kesihatan juga diberikan perhatian khusus, supaya pengendalian sinaran, penggunaan bahan berbahaya dan penggunaan peralatan dapat dibuat mengikut prosedur dan peraturan yang ditetapkan. Sistem pengurusan kemudahan bersepadu (IFM) telah mula dilaksanakan bagi memastikan semua peralatan dan kemudahan dapat dioptimumkan penggunaannya, selamat dan andal.

has jumped to RM21.1 mil, reflecting a 40% increment, as compared to the previous year. This figure is approximately 27% of the operational budget of Nuclear Malaysia. It is estimated that 80% of the clients are from the private sector, the majority of which came from the SMIs.

Technical Services

This activity acts as a support to stimulate the organic growth and to facilitate other activities such as R&D, physical development, maintenance of infrastructure and equipment, and management services. The activity is to promote effectiveness and efficiency in services, in a conducive environment to all staff members. The safety and health aspect are also given special attention to ensure the handling of radiation, utilization of dangerous materials and equipment are being done in accordance with stipulated regulation and procedures. An integrated facilities management (IFM) system has been implemented to ensure optimum use, safety and reliability of all equipment and facilities.

Realising the importance of having the emergency preparedness, and occupational safety and health plan in place, the system of occupational safety, health and environment has been established and implemented. The committee responsible has performed its duties in accordance with the requirements of Acts 304 and 514, among others, to identify problems and issues related to the occupational safety, health and environment at the workplace. In addressing issues of possible safety threats, including from radioactive materials and physical sources, the physical safety system has been upgraded with the installation of radiofrequency identification (RFID) and closed circuit televisions (CCTV) at strategic locations.

Menyedari kepentingan kesiapsiagaan kecemasan serta rancangan keselamatan dan kesihatan pekerjaan, sistem keselamatan dan kesihatan pekerjaan serta alam sekitar telah dibangunkan dan mula dilaksanakan. Sistem tersebut telah dikemas kini dari segi prosedur, arahan kerja dan pelaksanaannya. Jawatankuasa yang bertanggungjawab telah menjalankan fungsinya mengikut kehendak Akta 304 dan Akta 514 bagi mengenal pasti masalah dan isu-isu berkaitan keselamatan dan kesihatan pekerjaan serta alam sekitar di tempat kerja. Dalam usaha untuk menangani kemungkinan ancaman keselamatan, termasuk keselamatan bahan radioaktif dan keselamatan fizikal, sistem keselamatan telah dipertingkatkan, di mana Identifikasi Frekuensi Radio (RFID) dan kamera litar tertutup (CCTV) telah dipasang di beberapa tempat strategik.

Perkhidmatan Pengurusan

Sebagai nadi pentadbiran bagi sesebuah organisasi, aktiviti perkhidmatan pengurusan banyak ditumpukan sebagai sokongan untuk mempermudah aktiviti lain yang dilaksanakan di Nuklear Malaysia membabitkan perancangan strategik, pengurusan kewangan, hubungan dan kerjasama antarabangsa, pengurusan maklumat, pengurusan kualiti dan inovasi, serta peningkatan imej organisasi. Peningkatan aras standard prestasi perkhidmatan pengurusan membolehkan aktiviti di Nuklear Malaysia dijalankan dengan lancar tanpa banyak sungutan pelanggan.

Peruntukan kewangan daripada sumber belanja mengurus, belanja pembangunan dan akaun amanah telah diuruskan dengan baik sehingga secara purata lebih daripada 70% peruntukan berkenaan telah dibelanjakan secara berhemat untuk pelbagai tujuan.

Management Services

As the nucleus of an organization, the activities of management services are focused on providing support to facilitate other activities in Nuclear Malaysia, involving strategic planning, financial management, communication and international cooperation, information management, quality and innovation, and image enhancement. The improvement of performance standard in management services has enabled Nuclear Malaysia to perform its activities smoothly without any major complaint from customers. The operating and development expenditure as well as trust account has been well managed resulting in 70% of the allocation being wisely spent for various purposes.

A framework of Nuclear Malaysia Strategic Plan 2006–2010 has been prepared as a roadmap to guide Nuclear Malaysia in the right direction and stay relevant. The Plan is based on the result of analysis on expected scenario and challenges including the effects of socioeconomic, politic, environment, technology safety and security that may change the national science and technology landscape. The main component of this strategic plan is the change of status of Nuclear Malaysia to a statutory body apart from the possibility of Malaysia embarking on a nuclear power option. The change of status is necessary to facilitate the improvement of delivery system and responsiveness towards customers' needs, especially in R&D commercialization related activities.

Considering more benefits that can be generated, technical cooperation at various levels has been strengthened through bilateral and multilateral mechanisms, locally and internationally. The cooperation necessitates various activities, including research and training, interagency cooperative projects and the need to implement treaties,

Rangka Pelan Strategik Nuklear Malaysia 2006-2020 telah disediakan sebagai peta panduan bagi membolehkan semua aktiviti Nuklear Malaysia berada di landasan yang tepat dan relevan dengan tuntutan masa. Dalam menyediakan kerangka ini, analisis telah dibuat terhadap senario jangkaan dan cabaran yang mungkin merubah landskap teknologi nuklear negara termasuk faktor sosioekonomi, politik, persekitaran, teknologi serta keselamatan dan jaminan keselamatan. Unsur utama dalam pelan strategik ini adalah pertukaran taraf Nuklear Malaysia kepada badan berkanun selain kemungkinan negara meletakkan opsyen nuklear untuk penjanaan kuasa elektrik. Penukaran taraf adalah diperlukan bagi meningkatkan prestasi sistem penyampaian dan responsif terhadap kehendak pelanggan, lebih-lebih lagi dalam aspek melibatkan pengkomersilan hasil penyelidikan dan pemindahan teknologi.

Memandangkan banyak manfaat yang dapat diterbitkan, kerjasama teknikal di pelbagai peringkat terus diperkukuh melalui hubungan dwihala dan pelbagai hala, di dalam dan luar negara. Kerjasama ini melibatkan pelbagai aktiviti meliputi penyelidikan dan latihan, projek kerjasama antara agensi, serta keperluan pelaksanaan triti, konvensyen dan protokol. Penekanan Malaysia terhadap penggunaan teknologi nuklear untuk tujuan keamanan telah diterjemahkan melalui penglibatan aktif dalam konvensyen dan perjanjian pelbagai hala bagi memastikan semua peraturan keselamatan nuklear sentiasa dimantapkan dan diamalkan. Malaysia adalah di antara negara terawal di rantau ini yang telah menandatangani Triti Ketakcambahan Senjata Nuklear (NPT) dan Triti Pengharaman Menyeluruh Ujian Senjata Nuklear (CTBT). Sehubungan itu, sebuah stesyen pemantauan CTBTO telah didirikan di Malaysia bagi tujuan pemantauan dan pengesanan ujian senjata nuklear.

Sebagai sebuah organisasi berasaskan pengetahuan, pembelajaran sepanjang hayat dan peningkatan cendekia menjadi agenda penting Nuklear Malaysia. Infrastruktur

conventions and protocols. Malaysia's emphasis on the peaceful use of nuclear technology has been translated into the active involvement of Nuclear Malaysia in various conventions and multilateral cooperation in ensuring all safety regulations are being updated and practiced. Malaysia is among the earlier countries in this region to forge the agreement on Treaty on the Non-proliferation of Nuclear Weapons (NPT) and Comprehensive Test Ban Treaty (CTBT). In this regard, a CTBTO monitoring station has been established in Malaysia for the purpose of monitoring and detection of nuclear tests.

As a knowledge-based organisation, life-long learning and intellectual advancement is an important agenda. The necessary infrastructure has been upgraded. The library, for example, has been equipped with a collection of various information resources containing approximately 400,000 titles comprising books, journals and other periodic publications. Apart from housing International Nuclear Information System (INIS) of IAEA, this library is the main reference centre for nuclear information in Malaysia.

In ensuring a consistent and responsive service, a quality system management is being practiced to improve delivery system, especially for the frontline services. All service centres dealing with external customers are required to obtain the recognition of quality management system. To date, eight centres have successfully maintained the recognition, whereas two laboratories have retained the accreditation status. The other service centres are in the stage of document preparation for the accreditation. The integrated safety, health and environment system has been geared to developing a more comprehensive safety management system for Nuclear Malaysia. The early step has been taken to establish a service standard for internal customers for the promotion of a conducive and harmonious environment with cooperative staff members.

untuk menampung kehendak ini telah dipertingkatkan. Perpustakaan Agensi Nuklear Malaysia, misalnya, telah dilengkapi dengan koleksi sumber maklumat mengandungi kira-kira 400,000 judul terdiri daripada buku, jurnal dan penerbitan berkala yang lain. Selain menempatkan Sistem Maklumat Nuklear Antarabangsa (INIS) Agensi Tenaga Atom Antarabangsa (IAEA), perpustakaan ini juga adalah pusat rujukan utama berkaitan teknologi nuklear di Malaysia. .

Bagi memastikan para pelanggan memperoleh perkhidmatan yang konsisten dan responsif, sistem pengurusan kualiti telah ditekankan bagi menambahbaik sistem penyampaian, khususnya dalam hubungan pelanggan dan khidmat barisan hadapan. Semua pusat khidmat yang berurusan dengan pelanggan luar dikehendaki mendapatkan pengiktirafan sistem pengurusan kualiti. Pada masa ini 8 pusat khidmat Nuklear Malaysia telah berjaya mengekalkan pengiktirafan tersebut, manakala 2 makmal mengekalkan taraf akreditasi. Beberapa pusat khidmat lagi adalah dalam proses penyediaan dokumen bagi mendapatkan pengiktirafan. Sistem bersepadu pengurusan keselamatan, kesihatan dan alam sekitar telah digerakkan bagi mewujudkan sebuah sistem pengurusan keselamatan yang lebih komprehensif dan menyeluruh. Nuklear Malaysia telah mula mengorak langkah membangunkan satu standard perkhidmatan kepada pelanggan dalaman, yang meliputi suasana yang kondusif, harmoni dan saling bekerjasama.

Nuklear Malaysia terus mengambil langkah memperkukuh posisinya sebagai sebuah institusi nuklear yang unggul. Usaha meningkatkan imej organisasi dilaksanakan melalui aktiviti penerimaan awam. Penyertaan Nuklear Malaysia dalam pameran-pameran sains dan teknologi adalah suatu langkah mendekati masyarakat dan menyemai minat teknologi nuklear. Di samping itu, aktiviti ceramah, lawatan, penerbitan berkala, risalah maklumat dan publisiti dalam

Steps have been taken to strengthen Nuclear Malaysia as a premier nuclear institution, while efforts for image enhancement have been executed through public acceptance activities. Participation in science and technology exhibitions, and outreach programmes are amongst the activities undertaken to nurture the interest of the public and in getting technology closer to the society. In addition, talks, visits, periodic publications, information letters and other modes of publicity are also organised to attract the public. Public awareness on the benefit of nuclear technology for the societal well-being is necessary to facilitate the development of the activities especially when Malaysia decides for the nuclear power option.

Human Capital Development

Human capital development was implemented in line with the principle of improving the intellectual capacity and life-long learning concept. Expertise and skill building of human capital has taken centre stage as a support to ensure the R&D projects and other activities have been executed as planned. Internal seminars and fora have been conducted regularly and training opportunities have been explored to meet the training needs of staff in line with the capacity building and annual requirement of 7-day training for every staff member. Training has been planned to fulfill the requirement of all 322 researchers in various disciplines in nuclear science and technology. They are encouraged to seek for the higher academic degrees and efforts have been taken to increase the present ratio of B.Sc.:M.Sc.:Ph.D. from 56:24:20 to a higher ratio of postgraduate degree holders. Several strategies have been adopted for the training plan to address career development and competencies, with due attention given to the succession aspects. In facilitating researchers to obtain postgraduate degrees, a pioneer programme has been implemented with sponsorship of the Public Service

bentuk lain juga dilaksanakan untuk menarik minat awam. Kesedaran masyarakat akan manfaat teknologi nuklear untuk kesejahteraan hidup akan memudahkan usaha memperkembang aktiviti, tambahan pula jika negara memutuskan untuk menerima opsyen tenaga nuklear.

Pembangunan Modal Insan

Pembangunan modal insan diadakan selaras dengan prinsip mempertingkatkan kemampuan cendekia dan konsep pembelajaran sepanjang hayat dengan tumpuan kepada daya kecekapan dan kerjaya. Pembinaan kepakaran dan keterampilan modal insan telah diadakan bagi memastikan projek penyelidikan dan aktiviti lain dapat dilaksanakan seperti dirancang. Ceramah-ceramah dalaman sering diadakan, sementara peluang-peluang latihan diteroka bagi memenuhi keperluan latihan selaras dengan kehendak pembangunan keupayaan dan 7-hari latihan setahun bagi setiap warga. Rancangan latihan juga telah dirancang bagi memenuhi keperluan tenaga kerja penyelidikan Nuklear Malaysia yang kini berjumlah 322 Pegawai Penyelidik dalam pelbagai bidang sains dan teknologi nuklear. Mereka digalakkan melanjutkan pengajian ke peringkat ijazah tinggi dan usaha-usaha telah dibuat untuk meningkatkan peratusan nisbah B.Sc.:M.Sc.:Ph.D. daripada 56:24:20 ke suatu aras peratusan yang lebih tinggi bagi pemegang pascadijazah. Beberapa strategi telah diterima pakai dalam rancangan latihan untuk menangani pembangunan kerjaya dan kecekapan, dengan perhatian juga diberikan kepada aspek penggantian tenaga kerja.

Bagi memudahkan pegawai penyelidik mendapat kelulusan pascadijazah dalam perkhidmatan, satu program perintis telah dijalankan di bawah pembiayaan Jabatan Perkhidmatan Awam Malaysia. Program ini membolehkan sesuatu projek penyelidikan di Nuklear Malaysia yang

Department (PSD). This programme allows a project with merit to be accepted by a university for postgraduate study. There has been several researchers pursuing postgraduate studies through this mode at several local universities. The beauty of this programme is its two-pronged objectives " the possibility of obtaining the postgraduate degree without leaving the organisation's project, and at the same time ensuring the project is completed as planned within a stipulated time frame.

Nuclear Malaysia has fully utilised the international cooperation and relation especially with IAEA, in getting suitable training through courses, job attachment and scientific visit to premier international atomic research bodies. The presence of international fellows in Nuclear Malaysia is a clear signal of the sound human capital development policy and indicates the success of positioning efforts adopted.

As an appreciation to the contribution and expertise of human capital, there are promotion opportunities within the organisation and clear criteria have been set for this purpose. The Competency Level Assessment (PTK) courses have been properly planned and executed to prepare staff members the with necessary requirements needed for promotion.

Planning and Preparedness of Nuclear Power

Malaysia keeps abreast with the world development of technology and nuclear power through active involvement in related IAEA activities. Following the emerging issues on global warming as a result of excessive emission of carbon dioxide, nuclear energy has gained world attention as alternative energy resources. As such, the comprehensive planning and preparedness of nuclear power has been done in line with the study on energy demand

mempunyai merit dapat diterima oleh universiti sebagai projek pascaijazah. Terdapat sebilangan Pegawai Penyelidik yang mengambil peluang melalui pendekatan ini dan sekarang sedang mengikuti pelbagai pengajian di beberapa universiti tempatan. Keindahan program ini mempunyai matlamat serampang dua mata “memungkinkan warga penyelidik mendapat kelulusan ijazah tinggi tanpa meninggalkan projek, dan pada waktu yang sama dapat memastikan projek penyelidikan dapat disiapkan seperti dijangka.

Pada masa ini Nuklear Malaysia memanfaatkan sepenuhnya hubungan dan kerjasama antarabangsa, khususnya dengan IAEA, bagi memperoleh latihan yang sesuai melalui kursus, sangkutan dan lawatan saintifik ke agensi-agensi penyelidikan nuklear terkemuka luar negara. Kehadiran felo luar negara di Nuklear Malaysia memberi isyarat jelas tentang keampuhan dasar pembangunan modal insan dan menunjukkan kejayaan usaha positioning yang dijalankan.

Sebagai menghargai sumbangan dan kepakaran modal insan, peluang kenaikan pangkat telah direncana dan kriteria yang jelas telah disediakan. Untuk tujuan ini, kursus-kursus Penilaian Tahap Kecekapan (PTK) telah dirancang dan dilaksanakan bagi menyediakan warga kerja dengan syarat yang diperlukan untuk tujuan kenaikan pangkat.

Perancangan dan Persediaan Kuasa Nuklear.

Malaysia terus mengikuti perkembangan teknologi dan pembangunan kuasa nuklear dunia melalui penglibatan dalam aktiviti-aktiviti IAEA. Berikutan kemunculan isu pemanasan global yang disebabkan oleh pembebasan berlebihan gas karbon dioksida, tenaga nuklear telah diberi perhatian dunia sebagai sumber tenaga alternatif. Dengan itu perancangan dan persediaan kuasa nuklear secara

conducted by Economy Planning Unit (EPU) of the Prime Minister Department. The participation of Nuclear Malaysia is important since it has been chosen as the coordinator for national nuclear power development through interagency cooperation.

Activities have been planned and executed to generate public awareness to nuclear power, including for the general public, government agencies, private sector especially those involved in the power business and electricity generation. Expert and consultancy services were rendered to several local higher learning institutions on the possibilities of establishing nuclear engineering studies in the respective institution.

The commitment of Nuclear Malaysia in nuclear power development can be seen with the formation of a special team to handle matters relating to nuclear power and electricity generation.

Internationalisation

Nuclear Malaysia has gained direct benefits from international relation and cooperation established with several countries and international organisations. Such cooperation has not only improved the capability and expertise of staff, but also contributed to the development of human resources that are competent to take part in national industrial growth. The utilisation of nuclear technology in non-destructive testing (NDT) for the oil and gas industry, medical sterilisation, and radiopharmaceutical products supplied to hospitals are some of the benefits from the technology. This ability has attracted many international trainees to attend training courses or on-the-job attachment in Nuclear Malaysia. Some of the courses

komprehensif telah diadakan selaras dengan hasil kajian permintaan tenaga Unit Perancangan Ekonomi (EPU), Jabatan Perdana Menteri. Penglibatan Nuklear Malaysia menjadi lebih penting apabila dipilih sebagai agensi penyelaras pembangunan kuasa nuklear nasional melibatkan kerjasama antara agensi di Malaysia.

Rancangan juga telah dirangka dan aktiviti dilaksanakan bagi membangunkan kesedaran awam terhadap penjana kuasa nuklear di kalangan masyarakat, meliputi agensi kerajaan dan sektor swasta, khususnya industri tenaga dan penjana elektrik. Khidmat kepakaran dan perundingan juga telah diberikan kepada beberapa institusi pengajian tinggi tempatan akan kemungkinan penubuhan pengajian kejuruteraan nuklear di institusi masing-masing. Kesungguhan Nuklear Malaysia dalam pembangunan kuasa nuklear dapat dilihat daripada penubuhan satu pasukan khas untuk menangani perkara yang melibatkan kuasa nuklear dan penjana elektrik.

Pengantarabangsa

Nuklear Malaysia terus beroleh manfaat melalui pelbagai kerjasama antarabangsa dan antara negara. Kerjasama seperti ini bukan sahaja telah meningkatkan keupayaan dan kepakaran warga Nuklear Malaysia, tetapi juga menyumbang dalam pembangunan sumber manusia bagi membantu pertumbuhan industri negara. Penggunaan teknologi nuklear dalam ujian tanpa musnah (NDT) bagi industri minyak dan gas, sterilisasi peralatan perubatan, dan produk radiofarmaseutikal yang dibekalkan ke hospital adalah sebahagian daripada manfaat daripada kejayaan tersebut. Kemampuan kita juga telah menambat hati pelatih luar negara sehingga tidak sedikit daripada mereka yang memilih latihan secara sangkutan atau on-the-job training di Nuklear Malaysia. Sebahagian daripada latihan yang dianjurkan telah ditingkatkan ke peringkat antarabangsa

have been elevated to national and international levels, and have attracted foreign participation.

Overseas market, especially within the region and members of Organisation of Islamic Countries (OIC) has been explored in the area of training courses and consultancy works. The participation of Nuclear Malaysia in the international arena, including IAEA and CTBTO, has enhanced Malaysian image and has shown our willingness in sharing the knowledge and know how with other countries. Several local SMI companies have been nurtured to be competitive in the new market in line with government's call to penetrate global market.

Based on the capacity of human resources and infrastructure, IAEA has recognised Malaysia as an International Collaboration Centre (ICC) through Natural Polymer using Ionising Radiation Laboratory in Nuclear Malaysia. The IAEA recognition of Nuclear Malaysia as a Regional Training Centre has placed Malaysia as a training hub for Postgraduate Educational Course in Radiation Protection and Safety of Radiation Sources, conducted within the cooperative framework of Nuclear Malaysia-Universiti Sains Malaysia (USM)-IAEA. In 2007, the programme has attracted 25 participants comprising 22 internationals and 3 locals.

Outlook

Meeting the challenges ahead, the world class human capital will play a vital role, not only to execute the activities, but also having the ability to chart a new national science and technology landscape. Considering that Nuclear Malaysia is still in the stage of implementing activities of the 9MP for several more years, the way of implementation and the capability of work force will determine the success of the programme. It is expected that policy and priority

dan ketara berjaya meraih lebih banyak penyertaan peserta luar negara.

Pasaran luar negara juga telah diteroka bagi aktiviti latihan dan perundingan teknologi nuklear, terutama di negara-negara serantau dan Pertubuhan Negara-negara Islam (OIC). Penglibatan Nuklear Malaysia di persada antarabangsa khususnya dalam forum IAEA dan CTBTO telah menonjolkan imej Malaysia di mata dunia dan membuktikan kesediaan kita berkongsi kemakmuran dengan negara-negara seluruh dunia. Syarikat-syarikat tempatan di kalangan IKS dididik untuk meneroka pasaran baru selaras dengan seruan kerajaan bagi menembusi pasaran global.

Atas kapasiti sumber daya manusia dan kelengkapan prasarana, IAEA telah mengiktiraf Nuklear Malaysia sebagai Pusat Kolaborasi Antarabangsa (ICC) menerusi Makmal Polimer Semula Jadi menggunakan Sinaran Mengion. Pengiktirafan IAEA untuk Nuklear Malaysia sebagai Pusat Latihan Serantau bagi aktiviti latihan perlindungan sinaran telah meletakkan negara kita sebagai hub latihan 'Postgraduate Educational Course in Radiation Protection and Safety of Radiation Sources' yang dijalankan dalam kerangka kerjasama Nuklear Malaysia-USM-IAEA. Pada tahun 2007 program ini telah berjaya menarik 25 penyertaan, yang terdiri daripada 22 peserta antarabangsa dan 3 peserta Malaysia.

Harapan

Mendepani cabaran mendatang memerlukan persediaan modal insan bertaraf dunia yang mampu berperanan bukan sahaja untuk melaksanakan aktiviti yang dirancang, malah berupaya untuk mencorak landskap baru sains dan teknologi nuklear negara. Memandangkan untuk beberapa tahun akan datang ini Nuklear Malaysia masih lagi dalam

will not much change and the activities will still be executed within the framework of the National Agenda to achieve the status of a developed nation.

As a commitment towards corporate responsibility, Nuclear Malaysia will continue to focus on the core activities apart from special attention to the nuclear power planning and the change of status to a statutory body. Our clients will continue to be appreciated and our promises of delivering a better service, ethical and caring in line with the need of higher level of quality standard.

Nuclear Malaysia will continue to execute its functions with full responsibility through judicious and ethical actions to provide higher service standard in operational practices. There is no doubt that the coming years will be full of challenges, but our intention is to mobilise the resources to implement the activities by focusing on positioning, efficiency of human capital, organisational effectiveness and brand strength to elevate Nuclear Malaysia to a world class organisation.

kerangka pelaksanaan RMK-9, corak pelaksanaan dan kecekalan tenaga kerja akan menentukan kejayaan program tersebut. Adalah dijangka bahawa polisi dan keutamaan aktiviti tidak banyak berubah dan dijalankan dalam rangka Agenda Nasional untuk mencapai wawasan negara maju.

Sebagai komitmen terhadap tanggungjawab korporat, Nuklear Malaysia akan memberikan penekanan terhadap aktiviti teras yang dijalankan selain perhatian khusus kepada perancangan kuasa nuklear dan penukaran taraf Nuklear Malaysia sebagai sebuah badan berkanun. Pelanggan-pelanggan pula akan terus dihargai dan Nuklear Malaysia akan menjanjikan sebuah perkhidmatan yang lebih baik, berhemah dan mesra, selaras dengan tuntutan aras standard kualiti yang lebih tinggi.

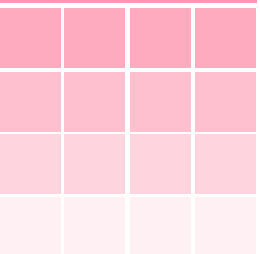
Nuklear Malaysia akan terus menjalankan fungsinya dengan penuh tanggungjawab melalui tindakan yang wajar bagi menyampaikan standard perkhidmatan yang tinggi dalam amalan operasi. Tiada keraguan bahawa tahun mendatang akan sarat dengan cabaran, namun Nuklear Malaysia berhasrat untuk menggerakkan aktiviti dengan memberikan tumpuan kepada positioning, kecekapan modal insan, keberkesanan operasi dan kekuatan jenama, bagi meletakkan Nuklear Malaysia sebagai sebuah organisasi bertaraf dunia.



Y. BHG. DATUK DR DAUD MOHAMAD
Ketua Pengarah, Agensi Nuklear Malaysia
Director General, Malaysian Nuclear Agency

DIARI KORPORAT

CORPORATE DIARY



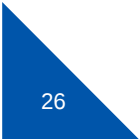












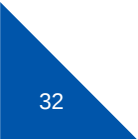




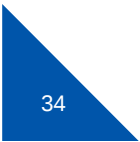




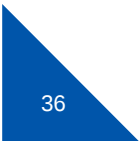














BARISAN PENGURUSAN MANAGEMENT TEAM



Barisan atas dari kiri ke kanan
Above from left to right

DR. MUHAMAD B. LEBAI JURI
Pengarah Kanan (Pengkomersilan & Perancangan
Teknologi)
*Senior Director (Technology Planning &
Commercialisation)*

DR. NAHRUL KHAIR B. ALANG MD RASHID
Timbalan Ketua Pengarah (Penyelidikan &
Pembangunan Teknologi)
*Deputy Director General (Research & Technology
Development)*

Y. BHG. DATUK DR. DAUD B. MOHAMAD
Ketua Pengarah
Director General

ADNAN B. HJ. KHALID
Pengarah Kanan (pengurusan)
Senior Director (Management)

DR. MUHD NOOR B. MUHD YUNUS
Timbalan Ketua pengarah (Teknikal)
Deputy Director General (Technical)

Barisan bawah dari kiri ke kanan
Below from left to right

RABIAH BT. ABU HASSAN
Pengarah Bhg. Pembangunan Sumber Manusia
Director of Human Resources Development Div.

TUAN SEMBAK B. TUAN ENDOT
Pengarah Bhg. Khidmat Pengurusan
Director of Management Services Div.

SAMSURDIN B. AHAMAD
Pengarah Bhg. Pengurusan Maklumat
Director of Information Management Div.

JAMAL KHAER B. IBRAHIM
Pengarah Bhg. Perancangan dan Hubungan Antarabangsa
Director of Planning & International Relationship Div.



BARISAN PENGURUSAN MANAGEMENT TEAM

Dari kiri ke kanan / from left to right

DR. WAN MANSHOL B. WAN ZIN
Pegarah Bhg. Pengkomersilan Teknologi
Director of Technology + Commercialisation Div.

DR. ABDUL NASSIR B. IBRAHIM
Pegarah Bhg. Teknologi Industri
Director of Industrial Technology Div.

IR. ABDUL WAHAB B. CHIK
Pegarah Bhg. Kejuruteraan
Director of Engineering Div.

DR. MOHD ASHAR B. HJ. KHALID
Pegarah Bhg. Sokongan Teknikal
Director of Technical Support Div.

MOHD YUSOF B. MOHD ALI
Pegarah Bhg. Keselamatan &
Kesihatan Sinaran
*Director of Health & Radiation
Protection Div.*



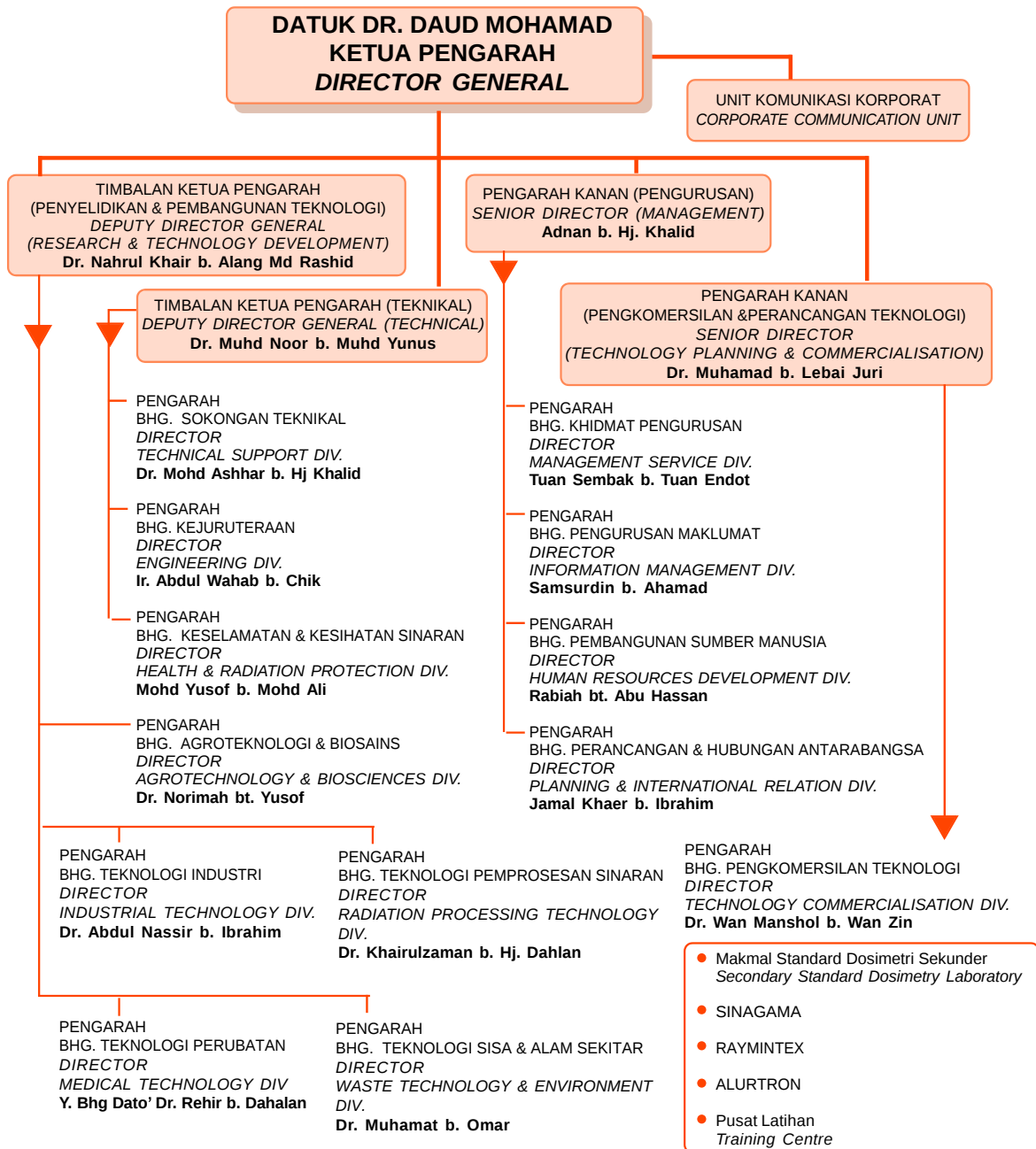
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DR. MUHAMAT B. OMAR
Pegarah Bhg. Teknologi Sisa & Alam Sekitar
Director of Waste Technology & Environmental Div.

Y. BHG DATO' DR. REHIR B. DAHALAN
Pegarah Bhg. Teknologi Perubatan
Director of Medical Technology Div.

DR. NORIMAH BT. YUSOF
Pegarah Bhg. Agroteknologi dan Biosains
Director of Agrotechnology & Biosciences Div.

DR. KHAIRUL ZAMAN B. HJ. DAHLAN
Pegarah Bhg. Teknologi Pemprosesan Sinaran
Director of Radiation Processing Technology Div.



Aktiviti R&D Nuklear Malaysia dirancang dan dilaksanakan dengan mengambil kira agenda pembangunan negara pada keseluruhannya, seperti yang telah dirumuskan dalam Pelan Strategik Kementerian Sains, Teknologi dan Inovasi (MOSTI) bagi Rancangan Malaysia Kesembilan (RMK9). Justeru, agenda negara untuk menjadikan Sains, Teknologi dan Inovasi (STI) sebagai pamacu pertumbuhan ekonomi terus diberi keutamaan di Nuklear Malaysia menerusi empat bidang utama, iaitu teknologi industri dan persekitaran, teknologi pemprosesan sinaran, teknologi perubatan serta agroteknologi dan biosains. Bidang keselamatan sinaran dan pengurusan sisa turut diberi keutamaan.

Sejumlah 154 projek penyelidikan dalam 10 bidang penekanan telah dilaksanakan dengan penambahan satu bidang baru iaitu pembangunan organisasi. Sesi pemantauan projek penyelidikan diadakan bagi meneliti kemajuan dan pencapaian projek. Hasil daripada pemantauan ini, projek-projek telah dikategori mengikut tahap kemajuan masing-masing. Jadual 1 dan 2, masing-masing menunjukkan bilangan projek penyelidikan mengikut bidang penekanan dan projek kerjasama dengan agensi luar.

R&D activities in Nuclear Malaysia are planned and implemented with consideration on the overall national development agenda as specified in the Strategic Plan of Ministry of Science, Technology and Innovation (MOSTI) for Ninth Malaysia Plan (9MP). Hence, the national agenda to make Science, Technology and Innovation (STI) as the key to economic growth is given emphasis in Nuclear Malaysia by focusing on four priority areas, industrial and environmental technology, radiation processing technology, medical technology and agrotechnology and biosciences. Emphasis is also given to radiation safety and waste management.

A total of 154 research projects in 10 priority areas were carried out with an addition of a new area i.e. organizational development. Monitoring of research projects was conducted to review their progress and achievement. From the outcome of the monitoring sessions, projects were categorized according to their level of achievement. Table 1 and 2 show the number of projects according to priority areas and external cooperation projects, respectively.



Jadual 1: Bilangan Projek Penyelidikan Mengikut Bidang Penekanan
Table 1: External Cooperation Projects

Bidang <i>Areas</i>	Bilangan projek <i>Number of projects</i>
Bahan istimewa <i>Special materials</i>	13
Alam sekitar dan sisa <i>Environment and waste</i>	22
Radiofarmasi dan biofarmasi <i>Radiopharmacy and biopharmacy</i>	0
Produk semula jadi <i>Natural products</i>	15
Pengimejan perubatan <i>Medical imaging</i>	6
Tenaga boleh diperbaharui <i>Renewable energy</i>	2
Keutuhan loji dan struktur <i>Plant and structure integrity</i>	19
Tanaman Industri <i>Industrial crop</i>	9
Polimer asli <i>Natural polymers</i>	9
Pembangunan kejuruteraan <i>Engineering development</i>	12
Pembangunan organisasi <i>Organizational development</i>	1
Jumlah <i>Total</i>	108

Jadual 2 : Projek Kerjasama dengan Agensi Luar
Table 2 : External Cooperation Projects

Projek kerjasama <i>Cooperation project</i>	Bilangan projek <i>Number of projects</i>
Projek kerjasama dengan industri <i>Cooperation project with Industry</i>	3
Projek kerjasama dengan Institusi Pengajian Tinggi Awam (IPTA) <i>Cooperation project with Higher Learning Institution</i>	1
Kontrak Penyelidikan IAEA IAEA <i>Contract Research</i>	7
Projek kerjasama teknikal dengan IAEA <i>IAEA Technical cooperation project</i>	6
Projek Kerjasama Dua Hala <i>Bilateral project</i>	1
Perjanjian Kerjasama Serantau bagi Asia Timur dan Rantau Pasifik (RCA) <i>Regional Cooperative Agreement for East Asia and Pacific Region (RCA)</i>	47
Forum Kerjasama Nuklear di Asia <i>Forum for Nuclear Cooperation in Asia (FNCA)</i>	9
Jumlah <i>Total</i>	74

Penyelidikan yang dijalankan berjaya menghasilkan 20 produk, 3 proses dan 2 prosedur baru (Jadual 3).

Dorongan berterusan yang diberi oleh Nuklear Malaysia untuk menggalakkan warganya menerbitkan buku, jurnal, melaporkan hasil penyelidikan serta pembentangan di peringkat kebangsaan dan antarabangsa semakin membuahkan hasil. Sejumlah 385 penerbitan telah dihasilkan (Jadual 4).

These research carried out resulted in 20 new products, 3 new processes and 2 new procedures (Table 3).

The continuous encouragement by Nuclear Malaysia to their staff to publish books, journals, report on research findings as well as presentation at national and international level produced encouraging results. A total of 385 publications were produced (Table 4).

Jadual 3 : Senarai Produk/Proses/Prosedur baru
Table 3 : List of New Product/Process/Procedure

Projek Project	Output Output
Nanokomposit Poliuretana/Tanah Liat berasaskan Minyak Sawit <i>Palm Oil Based Polyurethane/Clay Nanocomposites</i>	produk <i>product</i>
Komposit Mesra Alam <i>Green Composite</i>	produk/proses <i>product/process</i>
Penyediaan bahan bersaiz nano berasaskan getah asli menggunakan teknik Sol-gel <i>Preparation of natural rubber based nano-sized materials using Sol-gel technique</i>	prosedur/proses <i>procedure/process</i>
Penghasilan anak benih kultur tisu herba berskala besar: <i>Large-scale production of tissue culture plantlets of herbal plants:</i> i) Tongkat ali (<i>Eurycoma longifolia</i>) ii) Kacip fatimah (<i>Labisia pumila</i>) iii) Sambung nyawa (<i>Gynura procumbens</i>) iv) Karas (<i>Aquilaria malaccensis</i>)	produk/prosedur <i>product/procedure</i>
Pembangunan Biobaja berasaskan bakteria pengikat nitrogen untuk ladang herba <i>Development of Nitrogen-Fixing Bacteria-based Biofertilizer for Herbal Farm</i>	produk/proses <i>product/process</i>
Biobaja pelbagai fungsi PG <i>Multifunctional Biofert PG</i>	produk <i>product</i>
Biobaja pelbagai fungsi PA <i>Multifunctional Biofert PA</i>	produk <i>product</i>
Generator Tc-99m <i>Tc-99m Generator</i>	produk <i>product</i>
Penghasilan Kultur Sel dan Akar berskala besar menggunakan Bioreaktor: <i>Large-scale production of Cell and Root Cultures using Bioreactor:</i> i) Tongkat ali (<i>Eurycoma longifolia</i>) ii) Kacip fatimah (<i>Labisia pumila</i>)	prosedur/proses <i>procedure/process</i>
Pengkondisian Sisa DEHPA <i>DEHPA Waste Conditioning</i>	prosedur <i>procedure</i>
Laser Strain Mapper V2.0 <i>Laser Strain Mapper V2.0</i>	produk <i>product</i>
3-D Laser Image Profiler <i>3-D Laser Image Profiler</i>	produk <i>product</i>
Tentumuran seramik tanah purba menggunakan kaedah TLD <i>Ancient ceramic clay dating using TLD technique</i>	prosedur <i>procedure</i>
Penghasilan bata sluj minyak vitrifikasi untuk bahan laluan pejalan kaki <i>Production of vitrified oil sludge brick for pavement material</i>	proses <i>process</i>
Protokol penyaringan serangga <i>in vitro</i> <i>In vitro insect screening protocol</i>	prosedur <i>procedure</i>

Jadual 4 : Penerbitan
Table 4 : Publication

Bentuk Penerbitan <i>Publication Type</i>	Bilangan <i>Number</i>
Buku <i>Book</i>	5
Bab dalam buku <i>Chapter in book</i>	11
Jurnal antarabangsa <i>International journal</i>	31
Jurnal tempatan <i>Local journal</i>	12
Pembentangan kertas kerja di peringkat antarabangsa <i>Presentation of working paper at international level</i>	57
Penerbitan am di peringkat antarabangsa <i>General publication at international level</i>	5
Pembentangan kertas kerja di peringkat kebangsaan <i>Presentation of working paper at national level</i>	43
Pembentangan kertas kerja di seminar/bengkel dalaman <i>In-house presentation</i>	5
Penerbitan am tempatan <i>Local publication</i>	13
Laporan teknikal dalaman <i>Internal technical report</i>	47
Tesis <i>Thesis</i>	4
Jumlah <i>Total</i>	233

Nuklear Malaysia sentiasa berusaha mempromosikan hasil penyelidikannya melalui pelbagai saluran termasuk pameran, media cetak dan elektronik. Nuklear Malaysia telah menyertai beberapa pameran di peringkat kebangsaan dan antarabangsa seperti yang ditunjukkan di Jadual 5. Sebanyak 24 liputan media merangkumi media cetak dan elektronik telah dilaksanakan untuk memberi publisiti terhadap beberapa hasil penyelidikan Nuklear Malaysia yang berada pada tahap pengkomersilan.

Nuclear Malaysia has strived to promote her research findings through various channels including national and international exhibitions, as well as printed and electronic media. Nuclear Malaysia participated in exhibitions at national and international level as indicated in Table 5. A total of 24 media coverages including printed and electronic media were conducted to promote the research findings which are ready for commercialization.

Jadual 5 : Senarai Pameran
Table 5 : List of Exhibition

Bil. No.	Pameran Exhibition	Tarikh Date	Tempat Venue
1	Festival Sanjungan Satria (FESSAT 07)	3 - 4 Mac 2007	UKM, Bangi
2	Hari Pelanggan Nuklear Malaysia 2007 <i>Nuclear Malaysia Customer Day 2007</i>	20 Mac 2007	Nuklear Malaysia, Bangi
3	<i>School Wide Enrichment Model (SEM) Type III Fiesta</i>	29 Mac 2007	MRSM, Kuala Kubu Baru
4	Ekspo Teknologi Malaysia 2007 <i>Malaysia Technology Expo 2007(MTE 2007)</i>	29 - 30 Mac 2007	PWTC, Kuala Lumpur
5	Minggu Sains VOTEK SHAH 2007 <i>VOTEK SHAH 2007 Science Week</i>	13 April 2007	Sekolah Sains Sultan Haji Ahmad Shah, Pekan
6	Hari Harta Intelek Negara 2007 <i>National Intellectual Property Day 2007</i>	26 – 29 April 2007	KLCC, Kuala Lumpur
7	SMIDEX 2007	5 – 8 Jun 2007	KLCC, Kuala Lumpur
8	Pesta Sains Semula Jadi 2007 Natural Science Fiesta 2007	26 Mei – 3 Jun 2007	Pusat Sains Negara, Kuala Lumpur
9	Sambutan 25 Tahun Reaktor TRIGA PUSPATI (RTP) <i>25 Years Celebration of Reaktor TRIGA PUSPATI (RTP)</i>	27 – 28 Jun 2007	Nuklear Malaysia, Bangi
10	Pameran MOSTI sempena lawatan Timbalan Perdana Menteri, YAB Dato' Seri Najib Tun Razak ke Rompin, Pahang <i>MOSTI's exhibition in conjunction with Deputy Prime Minister, YAB Dato' Seri Najib Tun Razak visit to Rompin, Pahang</i>	14 Julai 2007	Padang Besar, Bandar Muadzam Shah

11	Pameran Minggu Sains, Teknologi dan ICT Negeri Johor 2007 (MISTI) <i>Johor State Exhibition of Science, Technology and ICT Week 2007 (MISTI)</i>	20 – 25 Julai 2007	Persada Johor, Johor Bahru
12	Pesta Rompin 2007 <i>Rompin Fest 2007</i>	22 – 26 Ogos 2007	Rompin, Pahang
13	Putrajaya Floria 2007	25 Ogos – 2 September 2007	Putrajaya Lake Front, Putrajaya
14	Hari Inovasi Nuklear Malaysia 2007 <i>Nuclear Malaysia Innovation Day 2007</i>	31 Julai – 1 Ogos 2007	Nuklear Malaysia, Bangi
15	Hari Memperingati Hiroshima 2007 <i>Hiroshima Memorial Day 2007</i>	8 Ogos 2007	Universiti Islam Antarabangsa, Gombak
16	BIOJOHOR 2007	17 – 20 Ogos 2007	Persada Johor, Johor Bahru
17	Konvensyen Teknikal Nuklear Malaysia 2007 (NTC 2007) <i>Nuclear Malaysia Technical Convention 2007 (NTC 2007)</i>	20 – 22 Ogos 2007	Nuklear Malaysia, Bangi
18	Gerak Usahawan 2007	25 – 26 Ogos 2007	PWTC, Kuala Lumpur
19	<i>RadTech Asia 2007</i>	3 – 6 September 2007	Hyatt Regency, Kuantan
20	<i>Global SMEs 2007</i>	6 – 8 September 2007	MATRADE Exhibition & Convention Centre, Kuala Lumpur
21	<i>European Malaysian Biotechnology Business Partnership 2007 (EUM-Bio 2007)</i>	24 – 26 Oktober 2007	MATRADE Exhibition & Convention Centre, Kuala Lumpur
22	Kesihatan Wanita dan Perubatan Tradisional Asia 2007 <i>Women's Health and Asian Traditional Medicine 2007 (WHAT Medicine 2007)</i>	16 – 18 November 2007	PWTC, Kuala Lumpur
23	Waste To Wealth 2007 (W2W 2007)	26 – 28 November 2007	PWTC, Kuala Lumpur
24	<i>BioMalaysia 2007</i>	27 – 30 November 2007	PWTC, Kuala Lumpur
25	Persidangan dan Pameran Inovasi Kebangsaan 2007 (NICE 2007) <i>2007 National Innovation Conference and Exhibition (NICE 2007)</i>	27 – 30 November	PWTC, Kuala Lumpur
26	Majlis Konvokesyen Universiti Malaysia Pahang <i>University Malaysia Pahang Convocation</i>	30 November – 2 Disember 2007	Kuantan
27	Kongres Mikologi Asia 2007 <i>Asian Mycology Congress 2007 (AMC)</i>	2 – 6 Disember 2007	Parkroyal, Batu Ferringhi

TEKNOLOGI INDUSTRI INDUSTRIAL TECHNOLOGY

Penyelidikan teknologi industri telah memperlihatkan kemajuan yang menggalakkan dalam bidang-bidang utama seperti bahan termaju, integriti loji dan struktur, dan polimer asli. Aktiviti utama adalah tertumpu kepada pembangunan produk dan perkhidmatan baru dalam usaha penambahbaikan berterusan.

Dalam bidang bahan termaju, terdapat tiga projek baru dibiayai oleh ScienceFund yang mana projek pertama adalah pembangunan meter dos pendarhaba (TLD) menggunakan bahan dopan bersaiz nano. Produk baru yang akan dibangunkan dari projek ini berpotensi mengurangkan kebergantungan kepada TLD yang diimport.

Projek kedua di bawah ScienceFund adalah pembangunan campuran bahan konduksi untuk aplikasi Low-Temperature-Co-fired-Ceramic (LTCC). Bahan yang terhasil boleh digunakan dalam keadaan suhu tinggi dan persekitaran sinaran, seterusnya dapat meningkatkan kebolehan Nuklear Malaysia dalam penyelidikan bahan untuk aplikasi nuklear. Di samping itu, hasil penyelidikan boleh digunakan untuk meneruskan kerjasama dengan Telekom Malaysia Research & Development Sdn Bhd (TMRD) untuk menghasilkan reka bentuk litar bersepadu dalam aplikasi LTCC.

The industrial technology research has shown a remarkable progress on priority areas such as advanced materials, plant and structure integrity, and natural polymer. The main activities are focused on new product development and services for continuous improvement.

In the area of advanced materials, three new ScienceFund projects were initiated whereby the first project is the development of thermoluminescence dosimeter (TLD) using nano-sized dopant material. The product developed from this project has the potential to reduce dependency on imported TLD.

The second ScienceFund project is the development of conducting paste for Low-Temperature-Co-fired-Ceramic (LTCC) application. Materials produced can be used in high temperature and radiation environment, and the outcome is expected to enhance Nuclear Malaysia's capability in materials research for nuclear applications. The outcome of this research will also facilitate the cooperation with Telekom Malaysia Research & Development Sdn Bhd (TMRD)

to produce integrated circuit design on LTCC application.

The third project is the development of novel moisture based polymer processing prototype for production of biocomposite material. The outcome of this



Projek ketiga adalah pembangunan prototaip pemprosesan polimer baru berasaskan lembapan untuk penghasilan bahan biokomposit. Hasil penyelidikan ini dapat meningkatkan pengetahuan mengenai pemprosesan biokomposit dan mewujudkan peluang untuk menghasilkan produk yang mempunyai nilai tambah yang tinggi.

Dalam bidang polimer asli, Nuklear Malaysia berjaya mempaten 1 produk dan 2 proses. Produk yang dipatenkan adalah hidrogel kanji, manakala dua proses yang turut dipatenkan adalah penghasilan makanan haiwan daripada sisa serat berselulosa kelapa sawit dan peralatan untuk prapemvulkanan lateks menggunakan sinaran.

Projek yang ditamatkan adalah pembangunan komposit kalis bunyi dan bising menggunakan fiber kayu getah/polietilena yang mampu memberi impak kepada industri pembinaan. Industri yang berasaskan bahan buangan fiber juga mendapat manfaat. R&D dalam bahan baru seperti pembangunan nanokomposit getah asli/polipropilena/tanah liat untuk aplikasi automotif, pemprosesan sinaran bahan nano dan pembangunan pes dari kitosan bergred bioperubatan untuk aplikasi perawatan luka masih diteruskan.

Dalam bidang integriti loji dan struktur, satu prototaip sensor tomografi dua modaliti untuk mengukur kadar aliran pepejal/gas dan imej dalam paip berjaya dihasilkan. Ia berbeza dari sensor sedia ada yang hanya memberikan bacaan tanpa imej.

Tiga projek yang masih dijalankan adalah tomografi industri berkomputer dan proses visualisasi, mekanisasi dan automasi kemudahan pengimbasan kolum dan kajian saintifik artifak logam warisan. Projek yang telah tamat adalah pembangunan prosedur pengesanan paip bawah tanah dan berjaya menghasilkan satu standard prosedur ujian

research will enhance the knowledge on biocomposite processing and open new possibilities of producing higher value added products.

In the area of natural polymer, Nuclear Malaysia patented 1 product and 2 processes. The patented product is starch hydrogel, whilst the patented processes are for producing feeds from the cellulosic fibrous wastes of oil palm, and process and apparatus for natural rubber latex prevulcanisation by radiation.

The project on development of sound and noise proofing rubberwood fibres-polyethylene composites has been completed and can provide a potential impact on building and construction industry. Industry that is based on waste fibre materials can also benefit from this project. R&D in new material such as natural rubber/polypropylene/clay nanocomposite for automotive application, radiation processing of nanomaterials and development of paste from biomedical grade chitosan derivative for wound management application are still being carried out.

In the area of plant and structure integrity, prototype of Dual Modality Tomography sensor to measure solid/gas flow rate and pipe internal image has been successfully developed whereby it is different from existing sensor that only provides measurement without image.

Three on-going projects are industrial computed tomography and process visualization, mechanization and automation of column scanning facilities and scientific research on heritage metal artifacts. Project that has been completed is the development of procedure for detection of buried pipes and the outcome is a standard testing procedure.

Aktiviti penyelidikan memberi fokus kepada pembangunan industri asas tani sebagai salah satu enjin pertumbuhan ekonomi negara.

Projek penyelidikan yang dijalankan berada pada pelbagai tahap kemajuan. Projek-projek ini secara keseluruhannya berasaskan penyelidikan biakbaka mutasi tumbuhan, produk dan sumber semula jadi serta amalan pertanian yang baik. Beberapa projek IRPA telah mencapai tahap akhir iaitu biakbaka tanaman makanan (pisang, betik, padi dan nanas) dan pembangunan sistem bioreaktor cempaka (*Michelia alba*), manakala kajian biopereputan tandan kosong kelapa sawit telah berjaya ditamatkan pada tahun ini. Dua projek baru iaitu kajian aruhan gaharu bagi pengeluaran komersil dan pembangunan teknologi mikropropagasi berskala besar pokok karas telah mula dijalankan di bawah peruntukan Institut Agrobioteknologi. Projek baru yang mula dijalankan pada tahun ini di bawah peruntukan ScienceFund adalah kajian pembangunan biobaja menggunakan sinaran dan teknologi penyurih, dan kajian kesan sinaran ke atas profil kimia herba

tempatan.

Nuklear Malaysia juga turut mengadakan projek kerjasama penyelidikan dengan agensi luar. Antaranya adalah projek biakbaka mutasi dan pembangunan sistem bioreaktor pokok karas dengan kerjasama dengan Jabatan Perhutanan Semenanjung Malaysia yang masih pada peringkat permulaan. Projek kerjasama dua hala Malaysia-Jepun iaitu projek biakbaka orkid menggunakan alur ion telah tamat pada tahun ini dan disambung dengan projek biakbaka kekwa yang juga mengaplikasikan teknologi alur ion. Selain

Research activities are focused on the development of agrobased industry as one of the engines for national economic growth.

*Research projects carried out are at various stages of implementation. These projects are based on plant mutation breeding, natural resources and products, and good agricultural practice. IRPA projects which have reached the final stage of implementation are breeding of industrial crops (banana, papaya, rice and pineapple) and development of *Michelia alba* bioreactor. Study on biodegradation of oil palm empty fruit bunches has been completed successfully. Two new projects, induction of gaharu for commercial production and development of large scale micropropagation technology for *Aquilaria* sp. are carried out under the funding of Agrobiotechnology Institute. New ScienceFund project are enhancement of biofertilizer using irradiation and isotopic tracer technique, and study on the effect of irradiation on chemical profile of local herbs.*



*Nuclear Malaysia also executed collaborative projects with other agencies. Among others are mutagenesis of *Aquilaria* and development of *Aquilaria* bioreactor system in collaboration with Forestry Department Peninsular Malaysia, which is at the initial stage of implementation.*

daripada itu, projek biakbaka orkid rintang serangga dan kajian penghasilan biobaja masih giat dijalankan melalui FNCA dan kini berada pada peringkat akhir.

Projek dalaman yang masih giat dijalankan adalah pembangunan sistem bioreaktor Tongkat ali dan mutagenesis cendawan. Antara projek-projek lain adalah kajian pengurusan agronomi pokok karas, kajian penghasilan oleoresin gaharu, pembangunan sistem ekstraksi serta penganalisaan kualiti minyak gaharu. Pada tahun ini juga beberapa projek telah tamat iaitu biakbaka limau madu dan tanaman hiasan, kajian etnobotani Hutan Belum, dan pembangunan kompos *Natural Farming* dan biobaja berasaskan mikroorganisma.

Antara perkhidmatan dan produk yang ditawarkan ialah analisa sampel N-15 dan C-14, khidmat nasihat dan penyinaran graf tisu untuk kegunaan klinikal, khidmat mikropropagasi tumbuhan, khidmat pengenalpastian bakteria, program latihan, kultivar baru tanaman hiasan untuk perlandskap, anak benih kultur tisu dan kompos untuk biobaja.



A Malaysia-Japan bilateral project on breeding of orchids using ion beam has been completed and continued with a new project on breeding of chrysanthemum which also applies the ion beam technology. In addition, projects on the development of insect resistance orchids and development of biofertilizer are carried out through FNCA and have reached the final stage.

In-house projects which are still being carried out include development of Eurycoma longifolia Jack (Tongkat ali) bioreactor system and mushroom mutagenesis. Other projects which are still in progress are agronomic management of Aquilaria, gaharu oleoresin inducer, development of extraction system and quality analysis of gaharu oil. Projects that have been completed this year are the improvement of Citrus sinensis and ornamental plants, etnobotany study of Hutan Belum and development of Natural Farming compost and microorganism-based biofertilizer.

Among services and products offered are N-15 and C-14 analysis, consultation and irradiation of tissue graft for clinical use, plant micropropagation, bacteria identification service, training programmes, new ornamental cultivars for landscaping, tissue culture seedlings and compost for biofertilizer.

KESELAMATAN DAN KESIHATAN SAFETY AND HEALTH

Aspek keselamatan, kesihatan dan perlindungan tempat kerja menjadi keutamaan dalam mewujudkan sekitaran kerja yang selamat dan kondusif. Aspek ini diselaraskan melalui Jawatankuasa Keselamatan dan Kesihatan Pekerjaan Nuklear Malaysia (JKKPNM). Langkah serius Nuklear Malaysia dalam mengendalikan aspek tersebut diperkukuhkan dengan Sistem Pengurusan Keselamatan, Kesihatan dan Alam Sekitar (SHE-MS). Hanya Prosedur Kecemasan bagi Reaktor telah disiapkan, manakala manual dan prosedur lain dalam SHE-MS masih di peringkat semakan. Antara aktiviti lain dalam mengemaskini SHE-MS ialah mengenalpasti hazard dan mengaudit peralatan keselamatan. Perlaksanaan sistem ini turut dijayakan melalui beberapa siri kursus keselamatan kepada pengarah, pengurus, penyelia kawasan dan pekerja sinaran.

Setiap tahun latihan kecemasan dilaksanakan bagi menyemak dan menambahbaik pelan tindakan kecemasan, prosedur yang berkaitan dan mengemaskini laluan kecemasan mengikut blok bangunan. Pada tahun ini, latihan

A safe and conducive working environment requires utmost importance in aspects such as safety, health and workplace protection. All these aspects are under the purview of Nuclear Malaysia Occupational Safety and Health Committee (JKKPNM). The roles of JKKPNM in ensuring safe working environment are further strengthened with the establishment of Safety, Health and Environment Management System (SHE-MS). Currently, only the Emergency Procedure for Reactor has been reviewed, whilst other manual and procedures in SHE-MS are still under review. Among other efforts undertaken to ensure SHE-MS is updated include hazard identification and audit of safety apparatus. A series of safety courses have been successfully conducted for directors, managers, area supervisor and radiation workers.

Emergency drill is conducted annually with the intention of reviewing and enhancing emergency response plan, the procedures involved and updating emergency exit route for each block. A series of emergency drill has been conducted by Emergency Response Team of Nuclear Malaysia (ERT) this year at reactor building and Waste Treatment Centre building. In view of a large number of research laboratories that use radioactive materials and



kecemasan yang dikendalikan oleh Pasukan Bertindak Kecemasan Nuklear Malaysia (ERT) telah mengadakan dua siri latihan iaitu di bangunan reaktor dan bangunan Pusat Pengurusan Sisa. Sistem keselamatan sentiasa ditambah baik memandangkan terdapat banyak makmal



penyelidikan yang menggunakan bahan radioaktif dan bahan kimia berbahaya. Penilaian Risiko Kimia ke atas Kesihatan (CHRA) telah dilaksanakan pada tahun ini dan satu laporan telah dikeluarkan kepada pihak Jabatan Keselamatan dan Kesihatan Pekerjaan (DOSH). Pemantauan dan penilaian yang berterusan telah dijalankan untuk memastikan tahap keselamatan dan kesihatan pekerja terjamin.

Aspek keselamatan, kesihatan dan alam sekitar sentiasa diberi perhatian serius oleh Nuklear Malaysia melalui program audit keselamatan. Program ini terbahagi kepada audit ke atas pengurusan khidmat keselamatan dan keselamatan kawasan kerja. Secara tidak langsung, program ini memastikan Nuklear Malaysia sentiasa mematuhi sistem keselamatan, kesihatan dan alam sekitar seperti yang ditetapkan dalam Akta 514, Akta 304, Akta 127 dan garis panduan IAEA.

dangerous chemicals, the safety system is constantly updated and improved. Chemical Health Risk Assessment (CHRA) has been implemented this year and a report has been submitted to Department of Safety and Health (DOSH). Currently, continuous monitoring and assessment in all safety aspects of radioactive materials and chemicals are being conducted to ensure the safety, health and wellbeing of workers.

Nuclear Malaysia has always given a serious attention to safety, health and environment aspects through its safety audit programme. The programme is for safety service management and safety at workplace. The implementation of the audit programme ensures that Nuclear Malaysia complies with safety, health and environment system as outlined in Act 514, Act 304, Act 127 and IAEA guidelines.

Procedures for security of nuclear and radioactive materials have been enhanced with the installation of closed circuit cameras in and around the reactor building. Rad Eye radiation detector has also been installed at the main entrance of Nuclear Malaysia for detecting radioactive materials.



Nuclear Malaysia has received numerous requests for its services in safety, health and workplace protection in nuclear related fields. Among the services are quality

Prosedur perlindungan keselamatan fizikal terhadap bahan nuklear dan radioaktif telah dipertingkatkan dengan pemasangan kamera litar tertutup di dalam dan sekitar bangunan reaktor. Pintu masuk utama Nuklear Malaysia

control test on X-Ray diagnostic apparatus, calibration service for radiology quality control apparatus, radiation leakage test on sealed industrial radioactive source and expert service in radiation protection.



turut dilengkapi dengan alat pengesan sinaran *Rad Eye* bagi mengesan bahan radioaktif.

Nuklear Malaysia telah mendapat permintaan dari agensi luar untuk perkhidmatan teknikal dan konsultasi keselamatan, kesihatan dan perlindungan tempat kerja dalam bidang nuklear. Antaranya adalah ujian kawalan mutu ke atas radas Sinar-X diagnostik, perkhidmatan tentukuran ke atas alat ujian kawalan mutu radiologi, khidmat ujian kebocoran punca terkedap kepada industri serta khidmat kepakaran perlindungan sinaran.

Nuklear Malaysia terus memberikan khidmat ujian kawalan mutu mikrobiologi ke atas produk perubatan dan ujian biodosimetri. Kontrak telah diperolehi untuk menjalankan ujian mikrobiologi berkala ke atas kemudahan siklotron di Hospital Putrajaya dan Wijaya International Medical Centre, Petaling Jaya. Satu bengkel telah diadakan dengan bantuan pakar dari IAEA untuk mempertingkatkan kemampuan dalam bidang biodosimetri.

Kemudahan pengeluaran radiofarmaseutikal telah mendapat pengiktirafan GMP oleh Biro Kawalan Farmaseutikal Kebangsaan dan proses pendaftaran semula produk Generator Tc-99m sedang diusahakan supaya pembekalan berkala kepada pusat perubatan dalam negara dapat diteruskan.

Nuklear Malaysia telah menganjurkan Bengkel Kajian Separuh Penggal Projek Siklotron dan Radiofarmaseutikal PET di kalangan negara-negara FNCA. Kerjasama telah dijalankan dengan Hospital Putrajaya dan Kementerian Kesihatan Malaysia untuk menghasilkan radiofarmaseutikal menggunakan kemudahan siklotron bagi memantau keberkesanan rawatan ke atas pesakit kanser. Kerjasama juga terus dikekalkan dengan Syarikat Innobiologics dalam penghasilan antibodi monoklonal untuk pengesanan kanser usus.

Nuclear Malaysia continues to provide microbiological quality control test on medical products and biological dosimetry services. Contracts have been secured to provide regular microbiology testing services on both cyclotron facilities at Hospital Putrajaya and Wijaya International Medical Centre, Petaling Jaya. A workshop was held with the assistance of IAEA expert to upgrade its capability in biological dosimetry.

The radiopharmaceuticals production facility obtained its GMP certification from the National Pharmaceutical Control Bureau. The re-registration process for Tc-99m Generator was pursued to allow its continuous regular supply to medical centres in the country.

A workshop on Midterm Review of the Cyclotron and PET Radiopharmaceuticals Project amongst FNCA member countries was organized by Nuclear Malaysia. Collaboration was undertaken with Hospital Putrajaya and Ministry of Health Malaysia in producing radiofarmaceutical using cyclotron facility to monitor treatment effectiveness on cancer patient. Besides that, the collaboration with Innobiologics company in the production of monoclonal antibodies for detection of colon cancer was maintained.



ALAM SEKITAR environment

Pelbagai kaedah sains dan teknologi nuklear telah dibangunkan dan digunakan dalam kajian alam sekitar. Kajian dijalankan termasuklah penggunaan teknik analisis nuklear untuk kajian pencemaran udara, tanah dan air termasuk marin, penggunaan teknik hidrologi isotop untuk membangunkan *fingerprinting* air empangan, teknik sinaran mengion untuk rawatan air sisa dan khidmat perundingan Penilaian Impak Radiologi (RIA) dan Penilaian Impak Alam Sekitar (EIA).

Kajian pesisir pantai dan marin berkaitan pencemaran bahan toksik dalam sampel-sampel persekitaran marin seperti air, sedimen dan biota yang mewakili seluruh perairan Malaysia telah dilaksanakan. Projek ini dibiayai di bawah peruntukan Nuklear Malaysia, ScienceFund dan IAEA melalui RCA. Agensi tempatan yang juga terlibat dalam pelaksanaan projek ini ialah UKM, Universiti Malaysia Terengganu (UMT) dan Jabatan Perikanan Malaysia. Hasil kajian yang diperolehi dapat digunakan sebagai data asas tentang bahan-

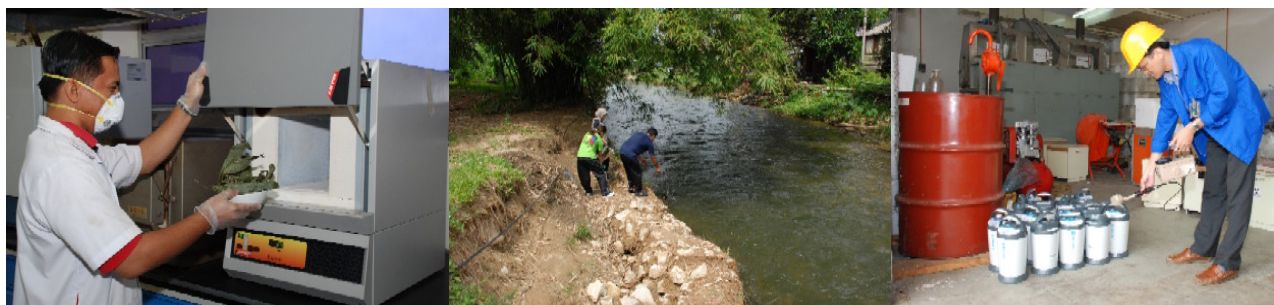
bahan pencemar yang wujud di persekitaran marin negara.

Nuklear Malaysia dengan kerjasama Jabatan Pengairan dan Saliran (JPS) telah menggunakan teknik hidrologi isotop untuk mendapatkan satu *signature/fingerprint* bagi memantau keselamatan dan ketahanan empangan. Data asas isotop stabil

Various nuclear science and technology methods have been developed and utilized in environmental research. The studies conducted include the usage of nuclear analytical technique in water, sediment and air pollution studies, isotope hydrological technique for development of dam fingerprinting, radiation ionizing technique for waste water treatment and Radiological Impact Assessment (RIA) and Environmental Impact Assessment (EIA) consultation services.

Coastal and marine studies in toxic pollutants in water, sediment and marine biota samples in Malaysian marine environment have been conducted. These projects were funded by Nuclear Malaysia, ScienceFund and the IAEA through RCA. Local agencies such as UKM, Universiti Malaysia Terengganu (UMT) and Fisheries Department of Malaysia also participated in the project implementation. The results will serve as a baseline data on the pollutants present at Malaysian marine environment.

Nuclear Malaysia in cooperation with Department of Irrigation and Drainage has employed hydrological isotope technique to obtain a fingerprint/signature in order to monitor the safety and reliability of a dam. Basic data on stabilized isotope and water chemistry will be used as future references to identify possible sources of dam seepage and leakage and water pollution. The cooperation between Nuclear Malaysia



dan kimia air akan digunakan sebagai rujukan masa depan bagi mengenalpasti sekiranya terdapat sumber resapan dan kebocoran empangan serta pencemaran air. Kerjasama ini berjaya membangunkan *isotopic dam signatures* untuk lima buah empangan iaitu Macap, Timah Tasoh, Bukit Kwong, Bukit Merah dan Beris. Kajian masa depan akan diperluaskan ke atas empangan milik Tenaga Nasional Berhad, Lembaga Kemajuan Pertanian Muda dan Jabatan Bekalan Air.

Kajian pencemaran udara di Kuala Lumpur telah dijalankan untuk menentukan kandungan, kepekatan dan sumber-sumber bahan pencemar. Selain asap pembakaran hutan, sumber pencemaran lain yang dikenalpasti adalah asap kenderaan dan industri.

Dalam usaha memahami pergerakan *leachate* dari *landfill*, penggunaan penyurih radioisotop telah dimanfaatkan. Teknik yang dibangunkan telah berjaya mengunjurkan pergerakan *leachate* dan dikaitkan dengan hidrologi kawasan.

Projek bagi pelupusan sisa radioaktif sedang dilaksanakan melibatkan kajian geologi penempatan khas untuk pelupusan sisa bahan radioaktif secara kekal dan peruntukan telah diperolehi.

Khidmat analisis keradioaktifan, keaktifan gross alfa dan beta, penganalisaan multiunsur serta logam berat dalam pelbagai jenis sampel sekitaran, industri, makanan dan minuman juga diberikan kepada pelanggan luar.

and JPS has enabled the development of isotopic dam signatures for five dams: Macap, Timah Tasoh, Bukit Kwong, Bukit Merah and Beris. There are plans to expand the research to other dams belonging to Tenaga Nasional Berhad, Muda Agricultural Development Authority and Jabatan Bekalan Air.

Research to determine the types, concentration and the sources of pollution has been carried out in Kuala Lumpur. Apart from smog from forest burning, smog from vehicles and industry have been identified as other sources of pollution.



In efforts to understand the leachate mobility from landfill, radioisotope tracer has been utilized. The technique developed has been able to extrapolate the leachate mobility and its association with hydrology of the area under study.

A radioactive waste disposal project involving geological special placement to permanently dispose radioactive waste is being carried out and funding has been obtained.

Services in radioactivity analysis, gross alpha and beta activity, multi-element and heavy metals analysis in environmental, industrial, food and drinking water have been provided to external customers.

Nuklear Malaysia terus memainkan peranan yang penting dalam menyumbang kepada pembangunan sosioekonomi negara yang mapan melalui pengkomersilan hasil-hasil penyelidikan yang berpotensi untuk dipasarkan. Aktiviti pengkomersilan teknologi ini adalah:

- Penjanaaan pendapatan;
- Pembangunan teknousahawan;
- Pembangunan Industri Kecil & Sederhana (IKS) ; dan,
- Peningkatan keupayaan teknologi.

Nuklear Malaysia aktif dalam memperkenalkan teknologi baru yang berpotensi dan teknologi sedia ada yang ditambah nilai untuk dipasarkan. Ini dapat dilihat menerusi aktiviti-aktiviti promosi dan penerimaan awam terhadap teknologi nuklear yang diadakan seperti :

- Hari Nuklear Malaysia Bersama Pelanggan;
- *technology showcase*;
- penyertaan dalam pameran-pameran peringkat kebangsaan seperti Pameran Perbadanan Pembangunan Industri Kecil dan

Nuclear Malaysia continues to play a major role by contributing towards the development of the nation's sustainable socioeconomy through the commercialization of potentially marketable research products. The activities for technology commercialization are:

- *Generation of revenue;*
- *Development of technopreneurs;*
- *Development of Small and Medium-scale Enterprises (SME) ; and,*
- *Enhancement of technological capability.*

Nuclear Malaysia plays an active role in introducing new technologies as well as adding value to existing technologies for the market. This can be demonstrated through promotional and public acceptance on nuclear technology activities such as:

- Hari Nuklear Malaysia Bersama Pelanggan;
- *technology showcase*;
- *participation in national exhibitions such as Small and Medium Industry Development Council (SMIDEC) Exhibition and Gerak Usahawan Nasional 2007;*
- *international exhibitions and*
- *industrial visits.*



Sederhana (SMIDEC) dan Gerak Usahawan Nasional 2007;

- pameran peringkat antarabangsa dan
- lawatan industri.

Promosi kepakaran yang ada di Nuklear Malaysia turut diiklankan di dalam *Malaysian SME Business Directory*, *FMM Directory*, *Oil & Gas Petrochemicals Directory* dan *Inter-Telecom Publishers*.



Nuklear Malaysia sebagai agensi penuh kerajaan, berperanan menyumbang kepada pembangunan sosioekonomi negara, terutama ekonomi baru berasaskan pengetahuan dalam teknologi nuklear. Bagi melaksanakan hasrat ini, Nuklear Malaysia mengadakan pelbagai aktiviti pemindahan teknologi bagi membantu melahirkan teknousahawan dan pembangunan IKS, antaranya ialah:

- program kesedaran dan pemasaran kepada IKS;
- menyediakan kemudahan seperti gudang, mesin dan peralatan. Tiga syarikat telah menggunakan peluang ini, iaitu Rumbia Bio-Tech Sdn. Bhd., Hexagon Green Sdn. Bhd. dan Pengkalan Offshore Sdn. Bhd. dengan menyewa makmal di Nuklear Malaysia;
- bengkel dan kursus teknousahawan untuk pegawai Nuklear Malaysia dan

Nuclear Malaysia's expertise are advertised in the Malaysian SME Business Directory, FMM Directory, Oil & Gas Petrochemicals Directory and the Inter-Telecom Publishers.



Nuclear Malaysia, as a full government agency is responsible for contributing towards national socioeconomic development, especially in the new knowledge-based economy, particularly on nuclear technology. To accomplish this, Nuclear Malaysia has carried out technology transfer activities to produce technopreneurs and the development of SME, which include:

- *SME awareness and promotional programme;*
- *provide facilities such as warehouse, machine and instruments. These opportunities have been taken up by three companies, Rumbia Bio-Tech Sdn Bhd, Hexagon Green Sdn Bhd and Pengkalan Offshore Sdn. Bhd. which have rented laboratories from Nuclear Malaysia;*
- *workshop and training for Nuclear Malaysia's technopreneurs and*
- *attachment of Nuclear Malaysia officers to SMEs and vice versa.*

In relation to this, Nuclear Malaysia has close ties with various agencies which include Perbadanan Usahawan

- tindakan di IKS untuk pegawai Nuklear Malaysia dan sebaliknya.

Sehubungan itu, Nuklear Malaysia mengadakan hubungan erat dengan pelbagai agensi termasuk Perbadanan Usahawan Nasional Bhd (PUNB), SMIDEC, Bank Negara dan Kementerian Pembangunan Usahawan dan Koperasi (MECD).

Hasil usaha dan rancangan yang dijalankan secara teratur dan berkesan, Nuklear Malaysia telah berjaya meningkatkan keupayaan pengkomersilan dan pemindahan teknologinya. Ini dapat dilihat melalui perjanjian dan persefahaman yang telah ditandatangani bersama syarikat-syarikat tempatan termasuk:

- Satu *Non-Disclosure Agreement* (NDA) untuk pembangunan output R&D oleh syarikat tempatan. NDA ini adalah bersama syarikat WWE Holding Bhd untuk Projek *Development of Integrated EB Radiation - Ion exchange - Biological Treatment System for Recycling of Industrial Waste Water for Industrial* yang ditandatangani pada Julai 2007;
- Perjanjian projek inkubator bersama tiga syarikat tempatan iaitu Rumbia Bio-Tech Sdn. Bhd., Hexagon Green Sdn. Bhd. dan Pengkalan Offshore Sdn. Bhd;
- Perjanjian usahasama dengan:
 - Origin Food Sdn. Bhd. untuk perkhidmatan sinaran gama yang ditandatangani pada Mac 2007;
 - High Valley Contract Manufacturing (GMP) Sdn. Bhd. untuk perkhidmatan sinaran gama yang ditandatangani pada Julai 2007;

Nasional Bhd (PUNB), SMIDEC, Bank Negara and Ministry of Entrepreneur and Co-operative Development (MECD).

Nuclear Malaysia has succeeded in improving its capability in commercialization and technology transfer. These can be verified by the agreements and cooperation signed with the national companies, which include:

- *A Non-Disclosure Agreement (NDA) for commercial development of R&D output by local companies. This agreement signed on July 2007 with the WWE Holding Bhd. on Development of Integrated EB Radiation - Ion exchange - Biological Treatment System for Recycling of Industrial Waste Water for Industrial;*
- *Agreements on incubator projects with three local companies namely Rumbia Bio-Tech Sdn. Bhd., Hexagon Green Sdn. Bhd. and Pengkalan Offshore Sdn. Bhd;*
- *Co-operative agreements with:*
 - *Origin Food Sdn. Bhd. for gamma irradiation service which was signed in March 2007;*
 - *High Valley Contract Manufacturing (GMP) Sdn. Bhd. for gamma irradiation service which was signed in July 2007;*
 - *TG Medical Sdn. Bhd. for gamma irradiation service which was signed in August 2007;*
 - *Wijaya International Medical Sdn. Bhd. on microbiology testing which was signed in November 2007 and*
 - *Wear Safe (Malaysia) Sdn. Bhd. for gamma irradiation service which was signed in December 2007*

- TG Medical Sdn. Bhd. untuk perkhidmatan sinaran gama yang ditandatangani pada Ogos 2007;
- Wijaya International Medical Sdn. Bhd. untuk ujian mikrobiologi yang ditandatangani pada November 2007 dan
- Wear Safe (Malaysia) Sdn. Bhd. untuk perkhidmatan sinaran gama yang ditandatangani pada Disember 2007

A total of RM21.1 million was generated from supply of product, technical services, education and training as well as through research contracts/ grants/ consultation, where the target groups are companies, industries and hospitals. This is 70% of the targeted RM30 million which is an increment of 28% compared to 2006.

Sebanyak RM21.1 juta telah dijana melalui pembekalan produk, perkhidmatan teknikal, pendidikan dan latihan serta kontrak/geran penyelidikan/rundingcara di mana kumpulan sasaran ialah syarikat, industri dan hospital. Perolehan ini adalah 70% daripada sasaran RM30 juta iaitu peningkatan sebanyak 28% berbanding tahun 2006.

Jadual 6: Pendapatan Nuklear Malaysia
Table 6: Nuclear Malaysia's Revenue

Aktiviti <i>Activities</i>	Pendapatan (RM juta) <i>Revenue (RM million)</i>
Bekalan produk <i>Supply of product</i>	3.82
Khidmat latihan <i>Training services</i>	3.18
Perkhidmatan teknikal <i>Technical services</i>	3.98
Kontrak/geran penyelidikan/rundingcara <i>Contract/research grant/consultancy</i>	10.08
Dividen daripada pelaburan <i>Dividend from investments</i>	0.89
Jumlah Keseluruhan <i>Grand Total</i>	21.14

KUALITI QUALITY

Kepentingan kualiti amat ditekankan selaras dengan teras kelima Rancangan Malaysia Kesembilan, iaitu bagi mengukuhkan keupayaan institusi dan pelaksanaan dalam meningkatkan sistem penyampaian perkhidmatan awam. Pelbagai inisiatif dan usaha telah dijalankan untuk meningkatkan kualiti perkhidmatannya termasuk Sistem Pengurusan Kualiti Menyeluruh (TQM), Pelaksanaan Sistem Pengurusan Kualiti berdasarkan MS ISO 9001:2000, KPI, Piagam Pelanggan, Penandaarasan, Kumpulan Meningkatkan Mutu Kerja (KMK), anugerah-anugerah kualiti dan inovasi, dan pejabat perkhidmatan pelanggan.

Nuklear Malaysia sentiasa memastikan perkhidmatan yang berkualiti tinggi dan bertaraf antarabangsa dalam kelasnya. Selain kepuasan pelanggan, ini juga penting bagi peningkatan imej. Nuklear Malaysia kini dalam pembangunan fasa pertama dan kedua Sistem Pengurusan Bersepadu (IMS) yang merangkumi aspek keselamatan nuklear, radiologi dan fizikal, keselamatan

The importance of quality is emphasized and this is in parallel with the fifth thrust under Ninth Malaysia Plan, which is to strengthen institutional and implementation capacity to increase the delivery system in the public service. Various initiatives and efforts such as Total Quality Management (TQM), Implementation of Quality Management System based on MS ISO 9001:2000, KPI, Customer Charter, Benchmarking, Quality Improvement Team (QIT), quality and innovation rewards and customer service office, were carried out to increase the quality of services.

Nuclear Malaysia maintains high quality and world class services. Beside customers' satisfaction, this is important to boost the image. Presently, Nuclear Malaysia is in the development of first and second phase of the Integrated Management System (IMS), which comprises the aspects of nuclear safety, radiology and physical, occupational safety and health, nuclear materials safeguards and environment protection. There are three identified phases for the development of IMS which are:

- **Phase 1:** Identification and documentation of integrated management policies and objectives,





dan kesihatan pekerjaan, kawal selia bahan nuklear dan perlindungan alam sekitar. Terdapat tiga fasa yang telah dikenalpasti bagi pembangunan IMS iaitu :

- **Fasa 1:** Mengenalpasti dan mendokumentasi dasar serta objektif pengurusan bersepadu yang merangkumi aspek keselamatan, kawal seliaan, kesihatan, alam sekitar, kualiti, pengurusan perolehan dan kewangan;
- **Fasa 2:** Mengemaskini dan mendokumentasi proses kerja utama setiap bahagian dalam aspek di atas dan
- **Fasa 3:** Mengenalpasti dan mendokumentasi prosedur kerja terperinci setiap proses utama setiap bahagian dalam aspek di atas.

Persijilan ISO 9001:2000 bagi lapan proses sedia ada telah dikekalkan, manakala bagi Program Jaminan Kualiti (QAP) bagi memenuhi kehendak IAEA untuk kemudahan reaktor penyelidikan nuklear sedang dibangunkan.

Bagi memastikan perkhidmatan yang terbaik dan berkualiti, beberapa pusat perkhidmatan dan pentadbiran dalam proses mendapatkan persijilan ISO iaitu khidmat latihan sumber manusia, perolehan, penyelenggaraan dan teknologi maklumat.

which consist of safety and security, safeguards, health, environment, quality, financial and revenue management;

- **Phase 2:** Updating and documentation of major work process for each division in the aspects mentioned above and
- **Phase 3:** Identification and documentation of detailed work procedures for each major process in each division in the aspects mentioned above.

ISO 9001:2000 certification for eight existing processes were maintained, while the Quality Assurance Programme (QAP) for the nuclear research reactor facility to comply with the IAEA requirement is in progress.

To ensure for the best and quality services, a few centres are also in the process of being ISO certified including human resource training, procurement, maintenance and information technology.

The ISO/IEC 17025 Certification for Environment Radiochemical (RAS) Laboratory and Secondary Standard Dosimetry Laboratory (SSDL) were maintained whereas the NDT Laboratory, Leak Test Laboratory, NAA Laboratory and Instrumentation Calibration Laboratory are in the process of being certified.

Internal audits and Chemical Hazard Risk Assessment (CHRA) criteria have been carried out for the implementation of Safety, Health and Environment Management System (SHE-MS) as required by the Department of Occupational Safety and Health (DOSH). In order to achieve Nuclear Malaysia's aim as a certification body for Safety of Ionizing Beam Audit, a procedure manual has been prepared to be submitted to the Department of Standards Malaysia.

Persijilan ISO/IEC 17025 bagi Makmal Radiokimia Alam Sekitar (RAS) dan Makmal Standard Dosimetri Sekunder (SSDL) dikekalkan, manakala Makmal NDT, Makmal Ujian Kebocoran, Makmal NAA dan Makmal Tentukuran Instrumentasi dalam proses mendapat pensijilan ini.

Bagi tujuan pelaksanaan Sistem Pengurusan Keselamatan, Kesihatan dan Alam Sekitar (SHE-MS) pula, audit dalaman dan kriteria *Chemical Hazard Risk Assessment* (CHRA) seperti yang ditetapkan oleh Jabatan Kesihatan dan Keselamatan Pekerjaan (DOSH) telah dilaksanakan. Ini adalah ke arah menjadikan Nuklear Malaysia sebagai badan persijilan untuk Audit Keselamatan Sinaran Mengion. Manual prosedur berkaitan sedang disediakan untuk dikemukakan kepada Jabatan Standards Malaysia.



Hari Kualiti Agensi Nuklear Malaysia telah diadakan pada 31 Oktober 2007 bertemakan Kualiti Cemerlang Agensi Terbilang sebagai usaha meningkatkan budaya kualiti dalam perkhidmatan.

Nuklear Malaysia telah mendapat pengiktirafan di peringkat antarabangsa apabila Makmal Teknologi Polimer telah diiktiraf oleh IAEA sebagai *International Collaborating Centre (ICC) for Radiation Processing of Natural Polymers*.



To ensure that the quality is being practised by all Nuclear Malaysia's officers, Nuclear Malaysia's Quality Day was celebrated on 31 October 2007 with the theme Kualiti Cemerlang Agensi Terbilang.

Nuclear Malaysia obtained international recognition when the Polymer Technology Laboratory was accredited by the IAEA as the International Collaborating Centre (ICC) for Radiation Processing of Natural Polymers.

Nuklear Malaysia sentiasa berusaha melahirkan penyelidik yang kreatif dan inovatif dalam sains dan teknologi nuklear. Bagi menyuburkan budaya inovasi di kalangan pegawai Nuklear Malaysia, penganjuran Hari Rekacipta dan Inovasi diteruskan.

Nuklear Malaysia aktif dalam penyertaan program inovasi kebangsaan dan telah memenangi beberapa pingat di Ekspo Teknologi Malaysia 2007. Penyertaan inovasi yang berjaya di pameran tersebut ialah:

- *Novel Organic Radioactive Waste Treatment Process and a New Method to Produce Functional Biomaterial* (pingat emas);
- *High Accuracy Compounding Calibration System for Light Density Micro-Agrofiber Composite* (pingat perak);
- *Low Cost Eddy Current Probe For Tube Inspection (EDDYPROBE)* (pingat perak)
- *Development of a Remotely Controlled Winder Cable for Industrial Radiography Gamma Ray Projector* (pingat perak)
- Bekalan Tongkat Ali – Perlindungan Tanpa Tanah (pingat gangsa)

Creative and innovative researchers in nuclear science and technology have been produced by Nuclear Malaysia. In order to inculcate innovation culture among Nuclear Malaysia's researchers, Hari Rekacipta dan Inovasi was organized.

Nuclear Malaysia is actively involved in national innovation programme and has won several medals in the Malaysian Technology Expo (MTE) 2007. Successful innovations were:

- *Novel Organic Radioactive Waste Treatment Process and a New Method to Produce Functional Biomaterial* (gold medal);
- *High Accuracy Compounding Calibration System for Light Density Micro-Agrofiber Composite* (silver medal);
- *Low Cost Eddy Current Probe For Tube Inspection (EDDYPROBE)* (silver medal)
- *Development of a Remotely Controlled Winder Cable for Industrial Radiography Gamma Ray Projector* (silver medal)
- *Tongkat Ali Supply – Plantation Without Soil* (bronze medal)

INOVASI
INNOVATION



PEMBANGUNAN MODAL INSAN HUMAN CAPITAL DEVELOPMENT

Pembangunan modal insan terus menjadi antara agenda utama Nuklear Malaysia dalam membentuk tenaga kerja yang mantap dengan memberi tumpuan kepada pembangunan kerjaya dan kompetensi.

Dalam usaha meningkatkan tahap profesionalisme, kualiti perkhidmatan dan hasil penyelidikan, pegawai digalakkan menjalani latihan di dalam dan luar negara. Sebanyak 58 kursus dalaman dan 10 ceramah etika dan motivasi yang melibatkan 2,883 penyertaan, telah diadakan. Seramai 131 pegawai telah menyertai 104 kursus luar negara manakala 550 telah menyertai 178 kursus yang dianjurkan di dalam negara.

Pembelajaran berterusan melalui program latihan formal amat digalakkan di Nuklear Malaysia dalam memperkukuhkan aktiviti R&D serta meningkatkan pengkomersilan teknologi. Sejumlah 35 pegawai sedang menjalani pengajian di peringkat Doktor Falsafah dan 70 peringkat Ijazah Sarjana. Daripada jumlah ini, seorang telah berjaya menamatkan pengajian di peringkat Doktor Falsafah manakala seramai 4 orang lulus

Ijazah Sarjana.

Dalam Penilaian Tahap Kecekapan (PTK), Nuklear Malaysia telah mengadakan tujuh kursus dan 53 peperiksaan serta menganjurkan tujuh kursus bimbingan. Selain daripada itu, sebanyak empat peperiksaan subjek

Human capital development continues to be among Nuclear Malaysia's main agenda in creating a strong work force by emphasizing on career and competency development.

In an effort to upgrade the level of professionalism, quality of services and research findings, officers were encouraged to attend courses held locally and abroad. A total of 58 courses and 10 motivational and ethical lectures have been organized which involved a total of 2,883 participations. A total of 131 officers participated in 104 courses abroad while 550 attended 178 local courses.

Formal training programmes were also encouraged in order to strengthen R&D activities as well as to enhance technology commercialization. A total of 35 and 70 officers were studying for Doctorate and Master Degree respectively. From this number, one has obtained PhD while 4 researchers have successfully completed Master Degree.

In Competency Level Assessment (PTK), Nuclear Malaysia has organized seven and 53 courses and examinations respectively as well as organized seven guidance courses. Apart from these, four departmental examinations were carried out in fulfilling service requirements.

Nuclear Malaysia had trained 150 trainees from local institution of higher education for industrial training and also supervised 55 post-graduates.



jabatan juga telah dilaksanakan bagi memenuhi syarat perkhidmatan.

Nuklear Malaysia telah menerima 150 pelatih dari pelbagai institusi pengajian tinggi untuk latihan industri serta menyelia 55 orang pelajar di peringkat sarjana dan doktor falsafah.

Di bawah Program Kerjasama Teknikal IAEA, tiga penyelidik berpeluang mengikuti program zamalah manakala tiga mengikuti lawatan saintifik dalam pelbagai bidang. Nuklear Malaysia menerima empat lawatan saintifik dan sepuluh misi pakar bagi memantapkan aktiviti penyelidikannya. Seramai sembilan felo IAEA dari beberapa negara termasuk Arab Saudi, Algeria, Myanmar, Vietnam dan Iran telah dilatih di Nuklear Malaysia dalam pelbagai bidang (Jadual 7).

Langkah proaktif telah diambil untuk menjamin kesinambungan pelaksanaan aktiviti Nuklear Malaysia di masa hadapan dengan menyediakan *training roadmap* bagi tahun 2008 hingga 2010 mengikut kepakaran yang sedia ada.

Under the IAEA Technical Cooperation Programme, three research officers underwent fellowship training programme while three researchers went for scientific visits in various fields. Nuclear Malaysia received ten expert missions to strengthen her research activities and four scientific visits. A total of six IAEA fellows from Saudi Arabia, Algeria, Myanmar, Vietnam and Iran were trained in various fields in Nuclear Malaysia (Table 7).

A proactive step to ensure the continuity of future activity implementation in Nuclear Malaysia, was taken by preparing a training roadmap for year 2008 until 2010 based on the current expertise.

Jadual 7. Bidang zamalah dan bilangan felo yang dilatih di Nuklear Malaysia
Table 7. Field of fellowship and number of fellows trained by Nuclear Malaysia

Bidang Fields	Bilangan Number
Pembangunan Tenaga Atom <i>Atomic Energy Development</i>	1
Kimia Nuklear dan Radiokimia <i>Nuclear Chemistry and Radiochemistry</i>	1
Teknologi dan Kejuruteraan Nuklear <i>Nuclear Engineering and Technology</i>	1
Hidrologi Isotop & Aplikasi Isotop dan Sinaran dalam Industri <i>Isotope Hydrology & Applications of Isotopes and Radiation in Industry</i>	2
Keselamatan Nuklear & Sinaran dan Sekuriti Nuklear <i>Nuclear & Radiation Safety and Nuclear Security</i>	1

PEMBANGUNAN FIZIKAL DAN KEMUDAHAN PHYSICAL DEVELOPMENT AND FACILITIES

Pembangunan pusat-pusat kemudahan dan infrastruktur diteruskankan lagi dengan pembinaan beberapa bangunan baru yang mengandungi peralatan dan teknologi terkini. Aktiviti penyelidikan dan khidmat pengesanan kerosakan struktur menggunakan teknologi nuklear digiatkan dengan adanya bangunan *Evaluation and Validation Facilities (EVF)*. Selain aktiviti penyelidikan, kemudahan ini menyediakan khidmat teknikal bagi pengesanan dan ujian seperti NDT terhadap pelantar minyak pesisiran, tangki dan paip air.

Pembangunan teknologi komunikasi tanpa wayar telah diperluaskan dengan pemasangan 40 *access point* di kedua-dua kompleks.

Facilities and infrastructures development was continued with construction of new buildings equipped with the latest technology and equipment. Research activities for structure defect detection using nuclear techniques would rapidly increased with the completion of Evaluation and Validation Facilities (EVF) building. It also provides technical service in NDT for offshore oil rig scanning, tank and water pipe line scanning.

Coverage for wireless communication was extended with the additional installation of 40 access points in the two complexes.



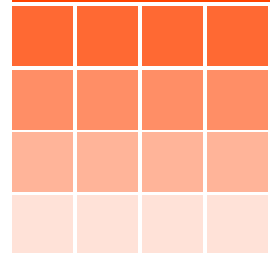
Pada tahun 2007 Nuklear Malaysia telah menerima peruntukan mengurus berjumlah RM58.94 juta. Peruntukan ini meliputi peruntukan mengurus sedia ada sebanyak RM57.49 juta dan *one-off* sebanyak RM1.45 juta. Kedua-dua peruntukan ini mencatat prestasi perbelanjaan sebanyak 92.8% dan 88.3%. Perbelanjaan keseluruhan untuk belanjawan mengurus ini ialah sebanyak RM54.65 juta (92.7%). Peruntukan pembangunan yang diterima berjumlah RM35.69 juta dan jumlah perbelanjaannya sebanyak RM29.25 juta (81.9%).

Peruntukan *science-fund* yang diterima untuk pembiayaan projek-projek penyelidikan adalah sebanyak RM1.4 juta manakala prestasi perbelanjaannya adalah sebanyak 31.9%.

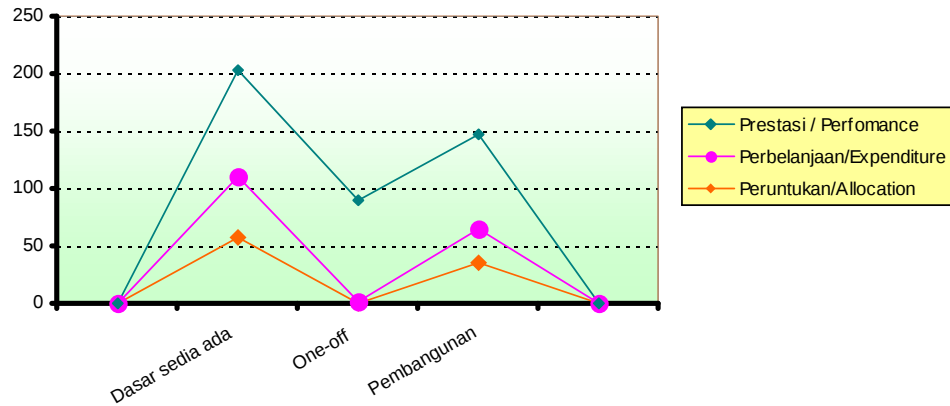
In 2007, the operating budget allocated for Nuclear Malaysia was RM58.94 million. This includes allocation for the RM57.49 million existing operating budget and RM1.45 million one-off budget. The performance for both budgets were 92.8% and 88.3% respectively. The total expenditure for operating budget was RM54.65 million (92.7%). The allocation for development budget was RM35.69 million and the expenditure was RM29.25 million (81.9%).

RM1.4 million of science-fund allocation was obtained for funding research projects of which the performance was 31.9%.

PRESTASI KEWANGAN FINANCIAL PERFORMANCE

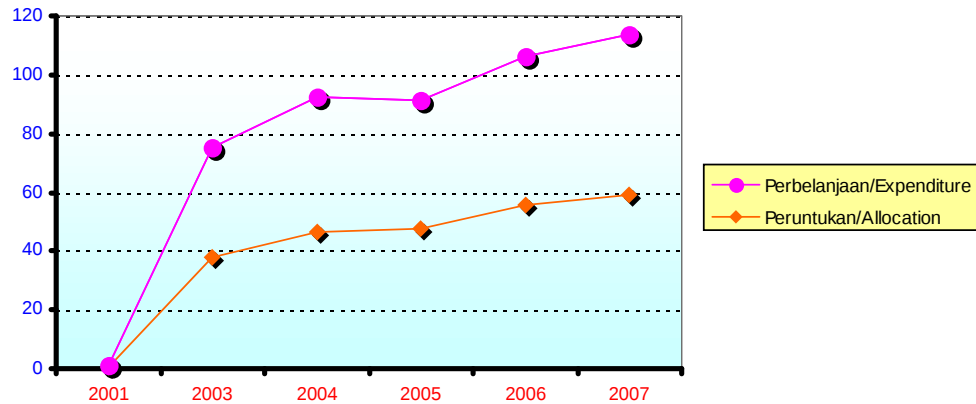


Jadual 8 : Prestasi Kewangan Nuklear Malaysia bagi tahun 2007
Table 8 : Nuclear Malaysia's Financial Performance for 2007



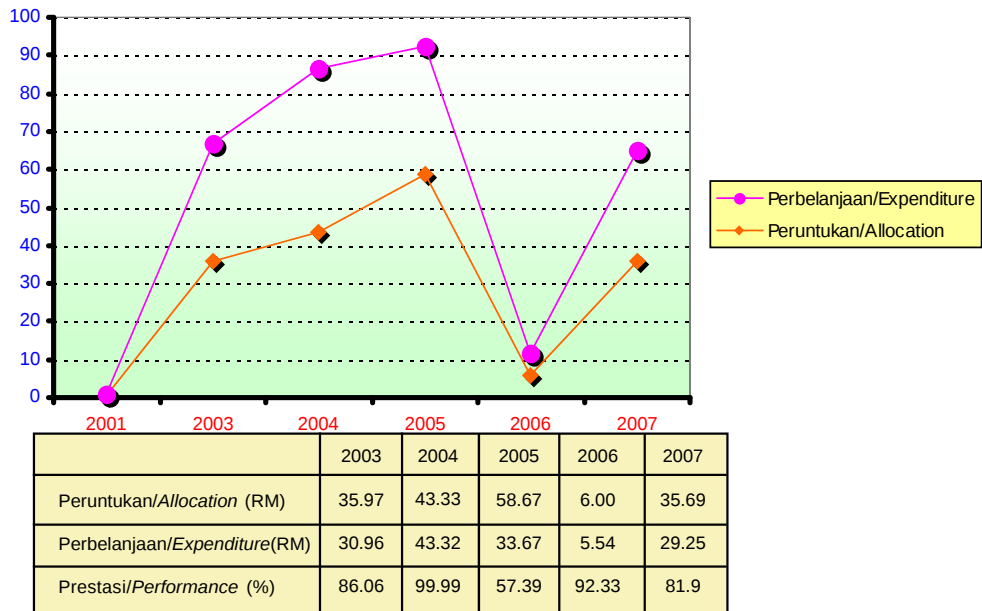
	Dasar sedia ada Existing operating	One-off One-off	Pembangunan Development
Peruntukan/Allocation (RM)	57.49	1.45	35.69
Perbelanjaan/Expenditure(RM)	53.37	1.3	29.25
Prestasi/Performance (%)	92.8	88.3	81.9

Jadual 9 : Mengurus (RM Juta)
Table 9 : Operating (RM Million)

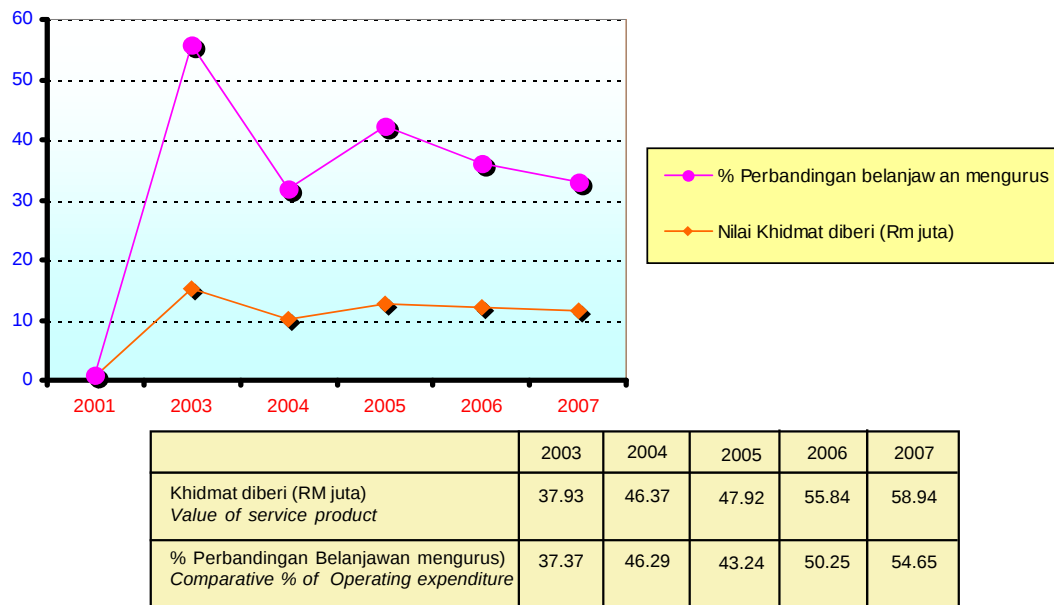


	2003	2004	2005	2006	2007
Peruntukan/Allocation (RM)	37.93	46.37	47.92	55.84	58.94
Perbelanjaan/Expenditure(RM)	37.37	46.29	43.24	50.25	54.65
Prestasi/Performance (%)	98.53	99.83	90.22	89.97	92.7

Jadual 10 : Pembangunan (RM Juta)
Table 10: Development (RM Million)



Jadual 11 : Pendapatan
Table 11 : Income



Fungsi utama Nuklear Malaysia masih kekal seperti di bawah Perintah Menteri-Menteri Kerajaan Persekutuan (No. 2) (Pindaan) 2005 (P.U. (A) 312) di bawah Akta Fungsi-Fungsi Menteri 1969 (Akta 2), seperti yang diwartakan dalam Warta Kerajaan Jld. 49, Bil. 17, bertarikh 25 Ogos 2005. Perintah P.U. (A) 312 yang merupakan punca kuasa terkini Agensi Nuklear Malaysia menetapkan fungsi-fungsi agensi seperti berikut, iaitu:

- Menjalankan penyelidikan dan pembangunan (R&D), khidmat dan latihan dalam bidang teknologi nuklear bagi pembangunan negara;
- Menggalakkan penggunaan, pemindahan dan pengkomersilan teknologi nuklear dan
- Menyelaraskan dan menguruskan hal ehwal nuklear kebangsaan dan antarabangsa serta menjadi agensi penghubung dengan Agensi Tenaga Atom Antarabangsa (IAEA).

Selain daripada dua teras aktiviti, iaitu Penyelidikan & Pembangunan Teknologi dan Pengkomersilan Teknologi, serta dua

aktiviti sokongan, iaitu Perkhidmatan Teknikal dan Perkhidmatan Pengurusan, aktiviti Pembangunan Modal Insan turut diberikan penekanan. Tumpuan utama Pembangunan Modal Insan adalah untuk pembangunan kerjaya dan kompetensi pegawai serta perancangan modal insan. Penekanan kepada aktiviti ini berpunca daripada kesedaran bahawa Nuklear Malaysia kini menghadapi situasi persaraan wajib sebahagian besar pegawai dalam tempoh sepuluh tahun ini. Pengambilan pegawai baru telah dilaksanakan semenjak tahun 2000 lagi sebagai langkah

The primary functions of Nuclear Malaysia remain unchanged as transcribed in Perintah Menteri-Menteri Kerajaan Persekutuan (No. 2) (Pindaan) 2005 (P.U. (A) 312) under the Akta Fungsi-Fungsi Menteri 1969 (Akta 2) and gazetted in Warta Kerajaan Jld. 49, Bil. 17, dated August 25, 2005. Order P.U. (A) 312 which is the current directive for Malaysian Nuclear Agency stipulates her functions as follows:

- *To carry out research and development (R&D), service and training in the field of nuclear technology towards national development;*
- *To promote use, transfer and commercialization of nuclear technology and*
- *To coordinate and manage national and international nuclear matters plus being the liaison agency between Malaysia and the International Atomic Energy Agency (IAEA).*

In addition to the two core activities, namely, Research & Technology Development and Technology Commercialization, and two supporting activities, which are Technical Services and Management, special emphasis is placed on Human Capital Development. The primary focus on Human Capital Development is for officers career advancement and competency as well as human capital planning. The need for this emphasis is due to the imminent situation of impending officers retirement on a large scale in this ten-year period. Intake of new officers has started since 2000 as a preparatory measure. To ensure that nuclear technology will continuously be utilized for national development, knowledge of retiring officers need to be transferred to the next generation.

persediaan. Pengetahuan pegawai yang akan bersara perlu diperturunkan kepada generasi seterusnya bagi memastikan teknologi nuklear terus dapat diaplikasi untuk kemakmuran negara.

Pelan Strategik Agensi Nuklear Malaysia 2006-2020 telah disediakan bagi menghadapi kemungkinan negara melaksanakan program kuasa nuklear. Nuklear Malaysia telah merancang untuk menjadi sebuah badan berkanun, berasaskan kepada penilaian cabaran strategik dari senario semasa dan unjuran masa hadapan di peringkat kebangsaan dan antarabangsa.

Status sebagai badan berkanun kelak akan mempercepat dan memudahkan proses pengkomersilan hasil penyelidikan dan pembangunan teknologi. Pendapatan yang dijana akan dapat membiayai lebih banyak aktiviti R&D bagi penjaan pengetahuan, kemakmuran serta kesejahteraan negara dan masyarakat.

Cabaran utama yang bakal dihadapi pada masa hadapan mungkin berpunca daripada Malaysia yang tiada pilihan selain kuasa nuklear untuk penjaan elektrik mulai pada tahun 2020. Kemungkinan ini perlu diambilkira bagi memastikan perbekalan tenaga terjamin sebagai asas kesinambungan pembangunan mapan sosioekonomi bagi tempoh jangka panjang.

Mulai tahun 2006, Nuklear Malaysia memberi penekanan khusus dan berasingan kepada perancangan dan persediaan kuasa nuklear. Ini adalah susulan daripada kenaikan harga minyak mentah dan ancaman perubahan cuaca akibat penghasilan gas rumah hijau dari pembakaran sumber tenaga fosil, yang menjadikan nuklear sebagai pilihan terbaik untuk menjana kuasa elektrik.

Nuklear Malaysia perlu bersedia dari segi kepakaran dan sokongan teknikal bagi menghadapi kemungkinan ini,

The Malaysian Nuclear Agency Strategic Plan 2006-2020 was prepared to deal with the possibility that Malaysia will implement a nuclear power programme. Nuclear Malaysia aspires to become a statutory body based on strategic assessments of current and future scenarios at national and international levels.

A statutory body status will accelerate and simplify the commercialization process of research and technology products. The revenue generated will fund more R&D activities for knowledge generation, wealth creation and societal & national well being.

The main challenge in the future is the probability that Malaysia will have no alternative but revert to nuclear power to generate electricity from 2020 onwards. This probability must be considered to guarantee a secure energy supply, a prerequisite for continuous socioeconomic development.

Beginning of 2006, Nuclear Malaysia gave special and separate emphasis on nuclear power planning and preparedness. This is due to the hike in oil price and the threat to global climate change due to the production of greenhouse gas from burning of fossil fuel, which make nuclear the best alternative for the generation of electricity.

Nuclear Malaysia needs to make the necessary preparation in terms of expertise and technical support to meet the possibility that the nation will revert to nuclear power as the lead time from start to be nuclear power ready is quite long, 10 to 15 years. The main focus of the nuclear power planning and preparedness activity are as follows:

kerana proses penyediaan bagi penjana kuasa nuklear memerlukan tempoh yang panjang antara 10 hingga 15 tahun. Tumpuan utama aktiviti perancangan dan persediaan kuasa nuklear ini adalah seperti berikut :

- Kajian Perancangan Dasar dan Semua Aspek Persediaan bagi Perlaksanaan Program Janakuasa Nuklear Negara dalam Tempoh Jangka Panjang dan
- Perancangan dan Pembangunan Modal Insan bagi Perancangan Persediaan dan Perlaksanaan Program Janakuasa Nuklear.

Lanjutan daripada aktiviti di atas, Nuklear Malaysia telah menyediakan satu draf terakhir Memorandum Bersama Kementerian Sains, Teknologi & Inovasi dan Kementerian Tenaga, Air & Komunikasi kepada Jemaah Menteri dengan tujuan memasukkan tenaga nuklear sebagai salah satu pilihan tenaga negara dan Nuklear Malaysia sebagai agensi penyelarasan pembangunan kuasa nuklear kebangsaan. Aktiviti-aktiviti kesedaran dan penyebaran maklumat kepada orang awam juga diteruskan melalui pembangunan kesedaran awam terhadap penjana kuasa nuklear, khususnya di kalangan agensi kerajaan, sektor industri tenaga dan janakuasa elektrik, institusi pengajian tinggi, media massa dan syarikat-syarikat berkaitan dengan tenaga.

Dalam menetapkan dan merancang aktiviti, Nuklear Malaysia sentiasa membuat penambahbaikan dengan mengambilkira obligasinya kepada pihak-pihak berkepentingan (*stakeholders*) dalam kecekapan dan keberkesanan pengurusan dan pelaksanaan tanggungjawabnya. Penambahbaikan akan dilaksanakan bagi memantapkan lagi perancangan operasi dan pengukuran prestasi Nuklear Malaysia. Selain daripada

- *Policy Planning Study and Every Preparatory Aspects for the Implementation of a Long Term National Nuclear Power Generation Programme and*
- *Human Capital Planning and Development for Preparedness Planning and Implementation of Nuclear Power Generation Programme.*

As a resumption of the above activity, Nuclear Malaysia has prepared and submitted a final draft Joint Memorandum with Ministry of Science, Technology & Innovation and the Ministry of Energy, Water & Communication to the Cabinet with intent to include nuclear power as one of the national's energy option and Nuclear Malaysia identified as the national nuclear power development coordinator. Awareness activities and information dissemination to the public on nuclear power generation were intensified especially amongst the government agencies, energy and electricity generation industry, institutes of higher learning, mass media and energy related companies.

In deciding and planning her activities, Nuclear Malaysia always go for progress and improvement, in line with the obligations to her stakeholders, in the efficiency and management effectiveness as well as executing her responsibilities. A number of upgrading will be done to consolidate Nuclear Malaysia's operation planning and performance assessment. Besides determining the target for 2008, Nuclear Malaysia will also make target projections for 2009 and 2010. These projections will yield clearer information and data for Nuclear Malaysia to prepare her annual management budget as required by the Ministry of Finance. Nuclear Malaysia will harmonize her KPI to fortify her performance assessment and conform to MOSTI's as well as the Ministry of Finance's requirements. This is also based on Nuclear Malaysia's determined

menetapkan SKT 2008, Nuklear Malaysia juga akan membuat unjuran bagi tempoh dua tahun ke hadapan iaitu bagi tahun 2009 dan 2010. Penetapan unjuran tersebut akan memberikan maklumat dan data yang lebih jelas bagi menyediakan anggaran belanjawan mengurus tahunan seperti mana yang dikehendaki oleh Kementerian Kewangan. Nuklear Malaysia juga perlu menyelaraskan KPI agensi bagi memantapkan lagi sistem pengukuran prestasi dan mematuhi keperluan dan kehendak MOSTI dan Kementerian Kewangan. Penyelarasan KPI ini juga adalah berdasarkan kepada penetapan SKT Nuklear Malaysia bagi membantu memudahkan aliran maklumat tersebut kepada pihak yang memerlukan.

annual target to help ease the flow of the necessary information to the relevant party.

Kelab MINT



PUSPANITA



KOPERASI KAKITANGAN PUSPATI BERHAD



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