

LAPORAN TAHUNAN 2017



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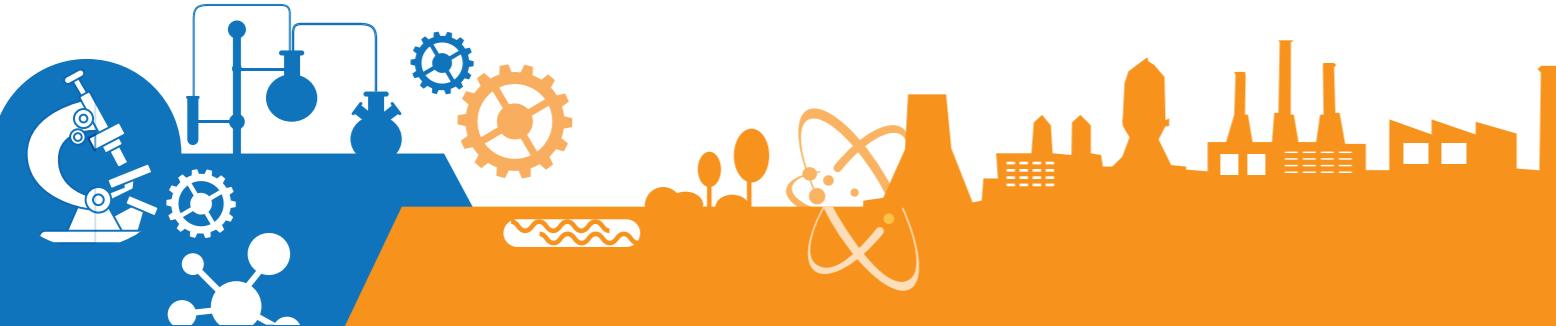
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PERUTUSAN MENTERI

KEMENTERIAN SAINS, TEKNOLOGI
DAN INOVASI



Y.B DATUK SERI PANGLIMA WILFRED MADIUS TANGAU

MESSAGE FROM THE MINISTER

MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION

Science, technology and innovation (STI) is one of the drivers for economic growth and socialwell being.

MOSTI has been always working hard to carry out its responsibility to drive the national transformation through STI. Innovation raises productivity through new or improved processes, technologies and business models in all sectors.

Sains, teknologi dan inovasi (STI) merupakan salah satu pemacu pertumbuhan ekonomi negara dan kesejahteraan masyarakat.

Justru, MOSTI sentiasa berusaha gigih untuk melaksanakan tanggungjawabnya sebagai peneraju perubahan negara dengan menjana kekayaan melalui STI. Melalui inovasi, produktiviti dapat dipertingkatkan dengan adanya penambahbaikan atau pembaharuan proses, teknologi dan model perniagaan dalam semua sektor.

Kekangan dari segi peruntukan dan kepakaran diatasi dengan menggiatkan Strategi Lautan Biru Kebangsaan (NBOS). Inisiatif seperti meningkatkan penyelidikan berdasarkan permintaan pasaran, memperkuuhkan kerjasama antara penyelidik dengan industri dan menggalakkan pelaburan swasta dalam penyelidikan, pembangunan, pengkomersialan dan inovasi (R&D&C&I) telah dilaksanakan. Kerjasama antara industri dan para penyelidik akan membantu untuk merangka penyelidikan dan pembangunan yang mempunyai potensi perniagaan, di samping menyumbang idea, infrastruktur, peralatan dan kepakaran. Inisiatif R&D&C&I yang bersepudu akan menjana pulangan pelaburan yang tinggi dalam jangka masa panjang dan merangsang peningkatan produktiviti.

Saya percaya, Nuklear Malaysia sebagai sebuah agensi yang meneraju teknologi nuklear di Malaysia telah memainkan peranan penting dalam menjalankan penyelidikan dan pembangunan (P&P) untuk menjana teknologi dan produk baharu. Peluang dan ruang yang diberikan kepada para penyelidik perlu dimanfaatkan untuk menghasilkan output penyelidikan berimpak tinggi. Selain itu, Nuklear Malaysia hendaklah lebih proaktif dalam mempromosikan teknologi nuklear dengan memberi penekanan terhadap aspek keselamatan. Kita dapat masih ramai individu atau organisasi yang berasa sangsi terhadap teknologi nuklear, khususnya untuk penjanaan tenaga; maka menjadi tanggungjawab kita untuk memberi suntikan kesedaran kepada mereka mengenai kebaikan dan kelebihan teknologi ini.

Constraints in terms of allocation and expertise are addressed by stimulating the National Blue Ocean Strategy (NBOS). Initiatives such as increasing market-driven research, enhancing cooperation between researchers and industries and encouraging private sector's investment in research, development, commercialisation and innovation (R&D&C&I) has been implemented. Cooperation between the industries and researchers will help to formulate a commercially viable R&D programme besides providing ideas, infrastructure, equipment and expertise. This integrated R&D&C&I initiative will generate high return on investment over time and stimulate productivity.

Nuklear Malaysia as a lead agency in nuclear technology is instrumental in conducting research and development (R&D), generating new technologies and products. Opportunities and means provided to researchers should be utilised to produce high-impact research outputs and outcomes. Nuklear Malaysia has to be more proactive in promoting nuclear technology to the public especially on safety aspects. There are still many individuals and organisations that are sceptical of nuclear technology, especially for generation of energy; hence, it is our collective responsibility to instill awareness among them on the benefits of the technology.

Y.B DATUK SERI PANGLIMA WILFRED MADIUS
Menteri Sains, Teknologi dan Inovasi
Minister of Science, Technology and Innovation

PERUTUSAN KETUA SETIAUSAHA

KEMENTERIAN SAINS, TEKNOLOGI
DAN INOVASI



MESSAGE FROM THE SECRETARY GENERAL

MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION

YBHG. DATUK SERI DR. MOHD AZHAR B. HJ. YAHAYA

understanding being translated into market ready R&D products. Under the 11th Malaysia Plan, MOSTI had emphasized mastery and empowerment in strategic areas and technologies to expand the country's competitiveness.

Selaku agensi peneraju pembangunan sains, teknologi dan inovasi (STI) adalah menjadi matlamat MOSTI bahawa kesedaran dan kefahaman STI terus dipertingkatkan

serta diterjemahkan secara praktikal iaitu di peringkat awal penjanaan idea sehingga kepada penghasilan produk R&D yang diterima pasaran. Malahan di bawah RMKe-11, MOSTI memberi penekanan kepada penguasaan dan pemerkasaan bidang dan teknologi strategik bagi meningkatkan daya saing negara.

As the lead agency for the development of STI, it is MOSTI' aspiration to see STI awareness and

Malahan di bawah RMKe-11, MOSTI memberi penekanan kepada penguasaan dan pemerkasaan bidang dan teknologi strategik bagi meningkatkan daya saing negara. Aktiviti R&D pula berorientasi permintaan yang melibatkan kerjasama erat antara institut penyelidikan, universiti dan industri serta inklusif, dengan penyertaan semua pemegang kepentingan.

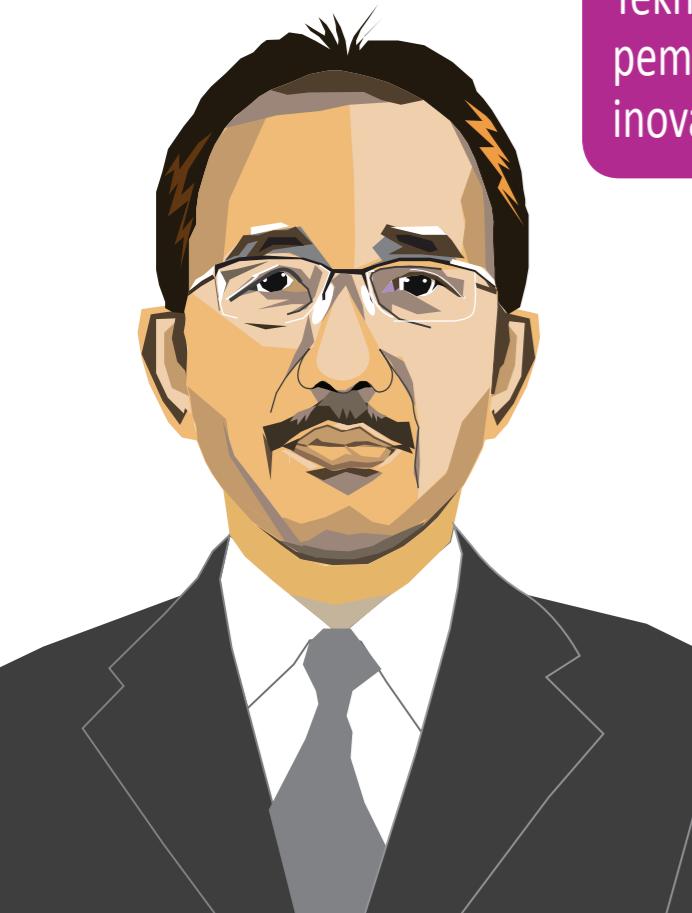
Aktiviti R&D juga menghadapi cabaran besar untuk "merakyatkan sains" iaitu memastikan seluruh anggota masyarakat, terutama di peringkat akar umbi, lebih mudah memahami STI serta dapat merasai impak STI ke atas urusan kehidupan harian dan kualiti hidup mereka. Dalam hubungan ini, MOSTI berusaha untuk berkomunikasi dengan pemegang kepentingan dalam bahasa yang lebih mudah difahami untuk menarik minat dan penglibatan mereka, ke arah agenda STI negara yang lebih inklusif. Pelbagai program seperti MOSTI Social Innovation (MSI) dilaksanakan dengan matlamat untuk mengarusperdanakan inovasi akar umbi sejajar dengan inovasi yang dihasilkan melalui makmal oleh para penyelidik dan saintis. Keutamaan diberikan kepada projek-projek yang kosnya rendah, berimpak tinggi dan boleh dilaksanakan dengan cepat.

Kejayaan Nuklear Malaysia mengaplikasi teknologi yang dibangunkan bagi memperkasa sosioekonomi masyarakat luar bandar dengan mewujudkan peluang pekerjaan dan meningkatkan pendapatan isi rumah adalah amat dihargai. Nuklear Malaysia juga terus menyokong agenda negara dengan memberi tumpuan pada projek penyelidikan yang berpotensi untuk dikomersialkan dan dapat memberi impak kepada ekonomi dan kemajuan negara.

Y.BHG DATUK SERI DR MOHD AZHAR B. HJ. YAHAYA
Ketua Setiausaha, Kementerian Sains, Teknologi dan Inovasi
Secretary General, Ministry of Science, Technology and Innovation

LAPORAN KETUA PENGARAH

AGENSI NUKLEAR MALAYSIA



SPEECH OF DIRECTOR GENERAL

MALAYSIAN NUCLEAR AGENCY

Nuklear Malaysia continues to be relevant as a function of the nation's nuclear technology. This function is in line with the role of the Ministry of Science, Technology and Innovation (MOSTI) as a driving force for innovation.

Nuklear Malaysia continued their excellence this year which is 48 large and potential research projects was commercialized and have been produced.

Nuklear Malaysia terus relevan sebagai fungsi peneraju teknologi nuklear negara. Fungsi ini selaras dengan peranan Kementerian Sains, Teknologi dan Inovasi (MOSTI) sebagai pemacu perubahan kekayaan melalui inovasi.

Kecemerlangan Nuklear Malaysia diteruskan pada tahun ini di mana sebanyak 48 buah projek penyelidikan berimpak besar serta berpotensi yang dikomersialkan telah dihasilkan.

Projek penyelidikan dan pembangunan (P&P) merupakan hasil di bawah dana *ScienceFund* dan memberi tumpuan terhadap enam teras utamanya iaitu teknologi perubatan, sumber air, sisa dan alam sekitar, teknologi industri, teknologi sinaran, teknologi reaktor nuklear serta agroteknologi dan biosains. Hasilnya, Nuklear Malaysia telah menghasilkan 15 produk, 7 proses, 19 prosedur, 2 pangkalan data dan 5 perisian. Jumlah penerbitan juga menunjukkan peningkatan iaitu sebanyak 434 penerbitan berbanding 386 pada tahun 2016. Penerbitan yang dihasilkan adalah meliputi buku, bab dalam buku, tesis, jurnal, pembentangan antarabangsa & kebangsaan, prosiding, penerbitan am serta lain-lain penerbitan.

Pada tahun 2017, Nuklear Malaysia juga meneruskan projek MOSTI *Social Innovation* (MSI). Menerusi projek MSI ini, masyarakat memperoleh manfaat bersama khususnya bagi meningkatkan tahap sosioekonomi ke arah yang lebih baik. Pelaksanaan projek MSI yang telah dijalankan adalah berdasarkan kepada kepakaran dan pengalaman pegawai penyelidik berserta kemudahan yang dimiliki di agensi ini. Antara projek MSI yang dijalankan adalah Projek Peningkatan Hasil Padi Menggunakan Paket Teknologi Nuklear, Paket Penanaman Stevia, Nanohibrid Biokomposit dan *Bamboo Liquid Smoke*.

Research and development (R&D) projects are the result of the *ScienceFund* fund and focus on its six core thrusts - medical technology, water resources, waste and environment, industry technology, radiation technology, nuclear reactor technology and agrotechnology and bioscience. As a result, Nuklear Malaysia has produced 15 products, 7 processes, 19 procedures, 2 database and 5 softwares. The total number of publications also showed an increase of 434 publications compared to 386 in 2016. The list of publication including books, book chapters, theses, journals, international & national presentations, proceedings, general publications and other publications.

In 2017, Nuklear Malaysia is also pursuing the MOSTI Social Innovation (MSI) project. Through this MSI project, communities benefit from these projects, especially to improve socioeconomic levels in a better condition. An implementation of the MSI project has been based on the expertise and experience of research officers and facilities in this agency. Among the MSI projects being carried out are Paddy Product Improvement Projects Using Nuclear Technology Package, Stevia Planting Package, Nanohibrid Biocomposite and Bamboo Liquid Smoke.



Pelbagai pencapaian telah dihasilkan di Nuklear Malaysia. Hasil kerja keras pasukan penyelidikan, kita mampu memperoleh kejayaan yang membanggakan. Nuklear Malaysia telah memperoleh kejayaan dengan merangkul 2 Emas, 2 Perak dan 1 Gangsa di Malaysian Technology Expo (MTE) 2017. Nuklear Malaysia juga memenangi 2 Emas di 28th International Invention, Innovation and Technology Exhibition (ITEX 2017) dan 7 Perak berserta 10 Gangsa pada Hari Inovasi Nuklear Malaysia (HINM) 2017.

Atas kejayaan dan kepaikan yang dimiliki oleh Nuklear Malaysia, 10 Perjanjian Kerjasama (MOA) dan 9 Perjanjian Kerahsiaan (NDA) telah ditandatangani. Hasilnya, sebanyak 5 produk iaitu baka baharu Cendawan Volvariella, Bioliquifert, GEM-2, SARM dan *Aquaculture Cage* telah dikomersialkan. Manakala 4 produk lagi iaitu *Calibration Radiation Measuring Instrument*, *High Dose Dosimetry For Industrial Application*, *TLD Personal Dosimetry* dan *OSL Personal Dosimetry* menembusi pasaran luar negara.

Pencapaian ini secara tidak langsung dapat meningkatkan kesedaran dan semangat para penyelidik dan penggalak kepada penghasilan produk inovasi lain. Kejayaan yang dicapai tidak akan terlaksana tanpa sokongan masyarakat awam. Justru program kesedaran awam mengenai teknologi amat penting. Pada tahun 2017 Nuklear Malaysia berjaya menarik seramai 2308 (mengikut data e-Client) orang pelawat ke agensi ini melalui beberapa siri lawatan.

Pelbagai usaha giat dijalankan untuk meningkatkan lagi kualiti dan kuantiti penyelidikan untuk menempuh cabaran pada masa akan datang. Tanpa sokongan dan kerjasama dari semua pihak baik dari masyarakat setempat, pegawai profesional dan pelaksana di Nuklear Malaysia, pastinya kejayaan ini tidak tercapai. Oleh yang demikian, Nuklear Malaysia berharap agar golongan ini akan terus menyokong dan membentuk hala tuju masa depan negara.

Y.BHG. DATUK DR MOHD ASHHAR HJ. KHALID
Ketua Pengarah Agensi Nuklear Malaysia

Various achievements have been made in Nuklear Malaysia. Base on the hard work of the research team, we are capable in achieving great success. Nuklear Malaysia has won 2 Gold, 2 Silver and 1 Bronze at Malaysian Technology Expo (MTE) 2017. Nuklear Malaysia also won 2 Gold at 28th International Invention, Innovation and Technology Exhibition (ITEX 2017) and 7 Silver with 10 Bronze at Nuklear Innovation Day Malaysia (HINM) 2017.

Due to the success and expertise of Nuklear Malaysia, 10 Memorandum of Agreement (MOAs) and 9 Non-Disclosure Agreement (NDAs) have been signed. As a result, as many as 5 products which is the new breed of Volvariella Mushrooms, Bioliquifert, GEM-2, SARM and Aquaculture Cage have been commercialised. The other four products, Calibration Radiation Measuring Instrument, High Dose Dosimetry For Industrial Application, Personal Dosimetry TLD and OSL Personal Dosimetry penetrate the overseas market.

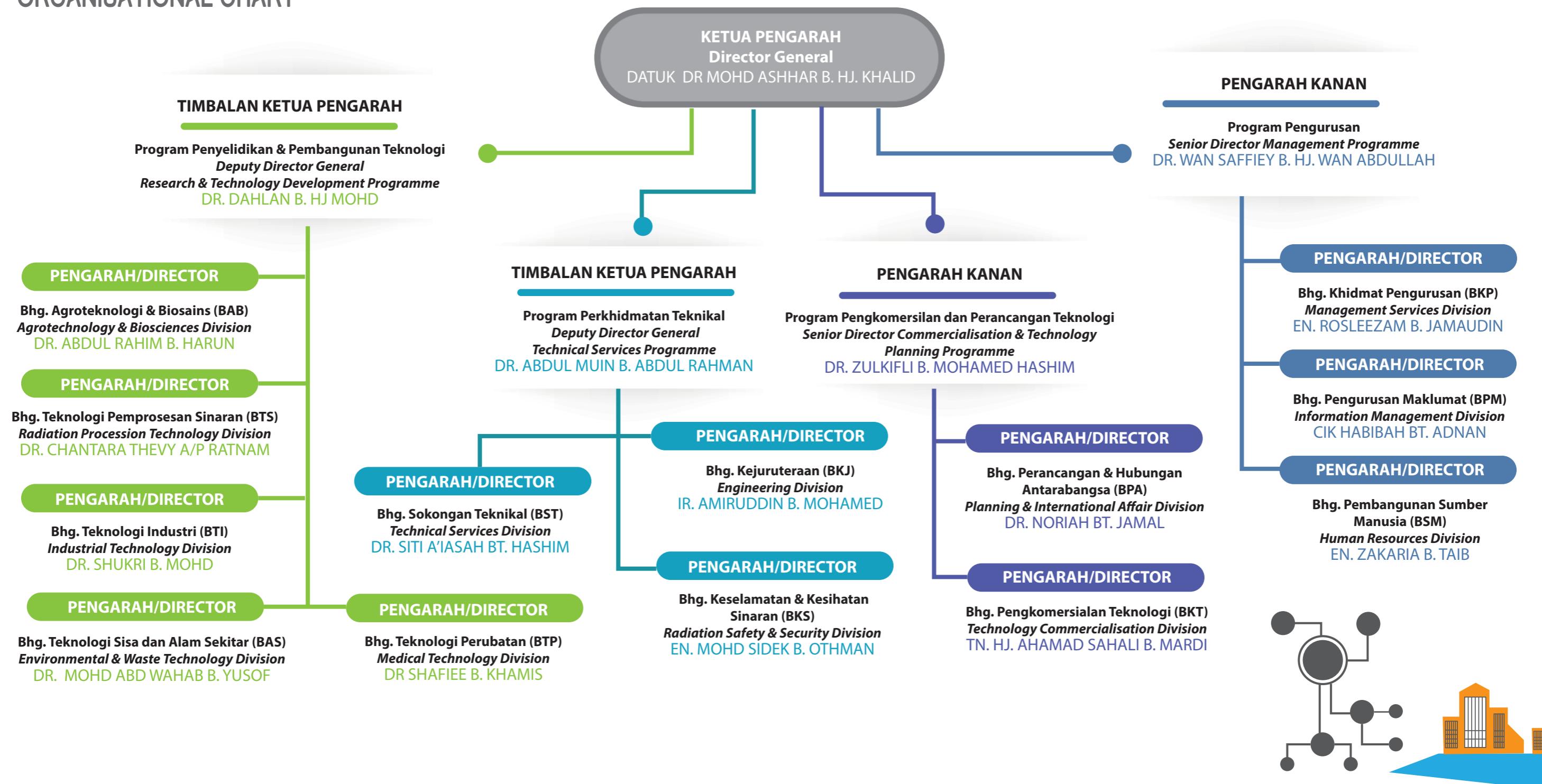
This achievement can indirectly raise the awareness and enthusiasm among researchers and as an incentive to create other innovation products. Success cannot be achieved without the support of the public. Hence, the public awareness programme on technology is very important. In 2017, Nuklear Malaysia attracted a total of 2308 (according to e-Client data) visitors to this agency through a series of visits.

Various efforts have been implemented to further improve the quality and quantity of research in facing challenges in the future. Without the support and cooperation of all parties from the local community, supporting and professional staff in Nuklear Malaysia, this is certainly cannot be achieved. Therefore, Nuklear Malaysia hopes that these groups will continue to support and shape the future direction of the country.

Y.BHG. DATUK DR MOHD ASHHAR HJ. KHALID
Director General Malaysian Nuclear Agency

CARTA ORGANISASI

ORGANISATIONAL CHART



BARISAN PENGURUSAN



PROGRAM PENYELIDIKAN & PEMBANGUNAN TEKNOLOGI RESEARCH & TECHNOLOGY DEVELOPMENT PROGRAMME



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



DR. ABDUL RAHIM B. HARUN
Pengarah Bhg. Agroteknologi & Biosains (BAB)
Director of Agrotechnology & Biosciences Division



DR. SHUKRI B. MOHD
Pengarah Bhg. Teknologi Industri (BTI)
Director of Industrial Technology Division



DR SHAFIEE B. KHAMIS
Pengarah Bhg. Teknologi Perubatan (BTP)
Director of Medical Technology Division



DR. CHANTARA THEVY A/P RATNAM
Pengarah Bhg. Teknologi Pemprosesan Sinaran (BTS)
Director of Radiation Processing Technology Division

PROGRAM PERKHIDMATAN TEKNIKAL TECHNICAL SERVICES PROGRAMME



DR. ABDUL MUIN B. ABDUL RAHMAN
Program Perkhidmatan Teknikal
Deputy Director General Technical Services Programme



EN. MOHD SIDEK B. OTHMAN
Pengarah Bhg. Keselamatan & Kesihatan Sinaran (BKS)
Director of Radiation Safety & Security Division



DR. SITI A'IASAH BT. HASHIM
Pengarah Bhg. Sokongan Teknikal (BST)
Director of Technical Services Division



IR. AMIRUDDIN B. MOHAMED
Pengarah Bhg. Kejuruteraan (BKJ)
Director of Engineering Division



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

PROGRAM PENGKOMERSIALAN DAN PERANCANGAN TEKNOLOGI COMMERCIALISATION & TECHNOLOGY PLANNING PROGRAMME



DR. ZULKIFLI B. MOHAMED HASHIM
Pengarah Kanan Senior Director



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



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

PROGRAM PENGURUSAN MANAGEMENT PROGRAMME



DR. WAN SAFFIEY B. H.J. WAN ABDULLAH
Pengarah Kanan Senior Director



EN. ZAKARIA B. TAIB
Pengarah Bhg. Pembangunan Sumber Manusia (BSM)
Director of Human Resources Division



CIK HABIBAH BT. ADNAN
Pengarah Bhg. Pengurusan Maklumat (BPM)
Director of Information Management Division



EN. ROSLEEZAM B. JAMAUDIN
Pengarah Bhg. Khidmat Pengurusan (BKP)
Director of Management Services Division

MANAGEMENT TEAM

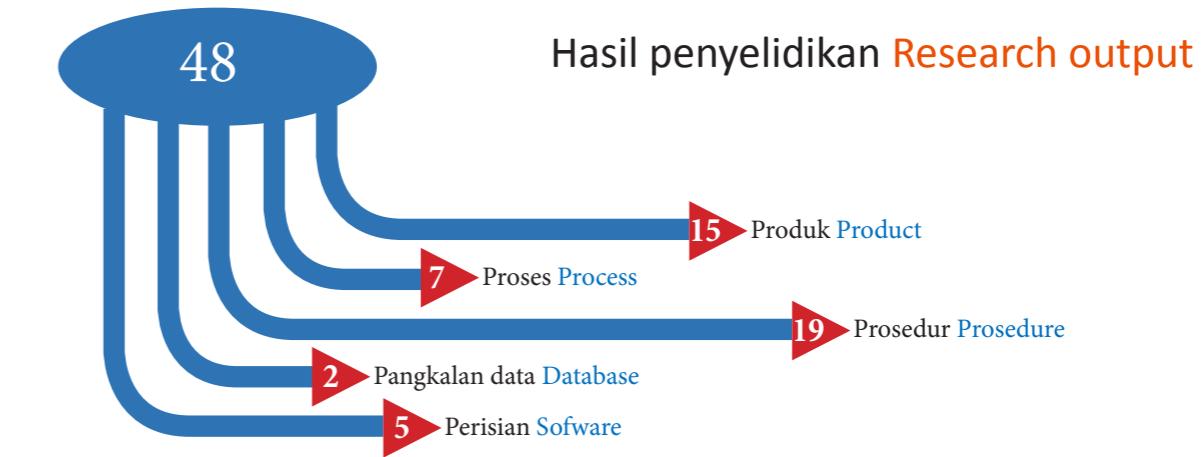
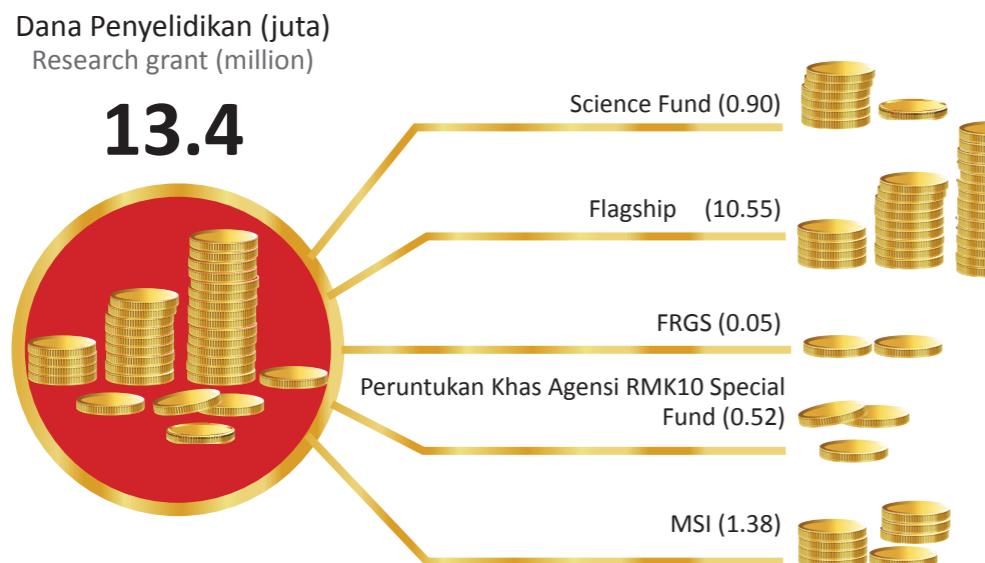


PENYELIDIKAN & PEMBANGUNAN TEKNOLOGI

RESEARCH & TECHNOLOGY DEVELOPMENT

Dalam bidang penyelidikan & pembangunan teknologi (P&P), Nuklear Malaysia sentiasa bergiat secara aktif untuk meneraju bidang utama P&P bagi meningkatkan industri dan produktiviti negara. Nuklear Malaysia juga memberi tumpuan terhadap enam teras utamanya iaitu teknologi nuklear dan berkaitan iaitu teknologi perubatan; sumber air, sisa dan alam sekitar; teknologi industri; teknologi sinaran; teknologi reaktor nuklear serta agroteknologi dan biosains. Enam teras utama ini membantu usaha negara bagi menjana jumlah hasil pendapatan khususnya meningkatkan produktiviti dalam bidang P&P. Berikut adalah pencapaian dalam bidang P&P :

In the field of research & technology development (R&D), Nuklear Malaysia is actively move forward in leading R&D areas to enhance the country's industry and productivity. Nuklear Malaysia also focuses on its six core thrusts - nuclear and related technologies namely medical technology; water resources, waste and environment; industrial technology; radiation technology; nuclear reactor technology as well as agrotechnology and biosciences. These six major thrusts help the country's efforts to generate revenue, in particular increasing productivity in R&D. Follows are R&D's achievements:



Senarai produk List of product

Penghasilan teh dari cendawan Volvariella volvacea	Anak benih stevia untuk Duta Nusajaya	Mutan cendawan Pleurotus Kelabu dan Putih	Produk biobaja pepejal berdasarkan Mushroom Spent Compost (MSC)
Improved corer sampler for lake, river and coastal application (Sediment Corer)	Coral Sampler	Produk Iodin	Radiation Compatible Thermoplastic Elastomers (TPEs) for HealthCare Industry
Prototype for battery cable	Real-time radiographic film digitizer		
Formulation of cable compound for automotive			Tiang sokongan Biokomposit untuk Sistem Perladangan Lada Hitam
Penghasilan Epoxidized Palm Oil Acrylate (EPOLA)/Overprint Varnish (OPV)	National Thorium Lab	Interlock concrete mould	Real-time radiographic film

Senarai proses List of process

- 1** Proses 'hardening' anak benih kultur tisu stevia untuk nurseri Duta Nusajaya
- 2** Pensterilan *Mushroom Spent Compost* menggunakan kaedah sinaran dan haba
- 3** Extraction methods for high yield production of vitexin from *Ficus deltoidea*
- 4** Proses pengeluaran kapsul iodin-131
- 5** Proses Penghasilan tiang sokongan biokomposit
- 6** Pulse Eddy Current Probe Fabrication
- Concrete mix design**

Senarai prosedur List of procedure

- 1** SOP for Rapid and Efficient Production of *Stevia rebaudiana Bertoni* Tissue Culture Seedlings
- 2** SOP penanaman, pembiakan dan penjagaan pokok mutan orkid dan kekwa
- 3** Protokol analisis sarang burung walit berdasarkan parameter:
 - a) isotop stabil - teknik IRMS
 - (i) Standard Operating Procedure for Determination of Stable Isotopes $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ in Edible Bird's Nest by Elemental Analyzer Isotope Ratio Mass Spectrometry (EA-IRMS)
 - (ii) Standard Operating Procedure for Determination of Stable Isotopes $\delta^{18}\text{O}$ and $\delta^{2}\text{H}$ in Edible Bird's Nest by High Temperature Isotope Ratio Mass Spectrometry (HTEA-IRMS)
 - b) unsur surih - teknik ICPMS dan NAA
 - (i) Standard Operating Procedure for Determination of Trace Elements in Edible Bird's Nest by Inductively Coupled Plasma – Mass Spectrometry (ICP-MS).
 - (ii) Standard Operating Procedure for Determination of Trace Elements in Edible Bird's Nest by Neutron Activation Analysis (NAA)

c) profil metabolit teknik LC-MS

Standard Operating Procedure for Metabolomic Analysis of Edible Bird's Nest Using Ultra-Performance Liquid Chromatography-Quadrupole/Time-of-Flight Mass Spectrometry (UPLC-Q-TOF LC-MS)

d) DNA barcoding untuk penentuan ketulenan

Standard Operating Procedure for Traceability of Edible Bird's Nest Using DNA Barcoding

- 4** SOP Penghasilan Benih *Volvariella volvacea* menggunakan teras kenaf

- 2** SOP for Stevia Post-Harvest Process

- 3** Procedure For Measuring Qualitative and Quantitative of The Gamma Emitteradioactivity Using Gamma Spectrometry System for Nuclear Forensic

- 5** Prosedur Pengeluaran Kapsul Iodin-131

- 6** Prosedur Kawalan Mutu Iodin -131

- 7** FNCA Guidelines on Chitosan PGP Application for Rice, Chilli and other Crops

- 8** Procedures for Gas Sensing Measurements

- 9** Procedure for Concrete Mixed Design

- 10** Procedure for Surveying Old and Damaged Building

- 11** Operating procedure for hot dipping controller

- 12** Procedures for Electrospinning

- 13** Procedure of Portable Gamma Scorpion Computed Tomography

- 14** Radiographic Testing – Digital (Rt-D) Inspection Procedure: Wall Thickness Measurement For Pipes Using Digital Detector Array (DDA) With X-Ray

- 15** Industrial Radiography Emergency Response Plan Procedure for Careion Technologies Sdn. Bhd

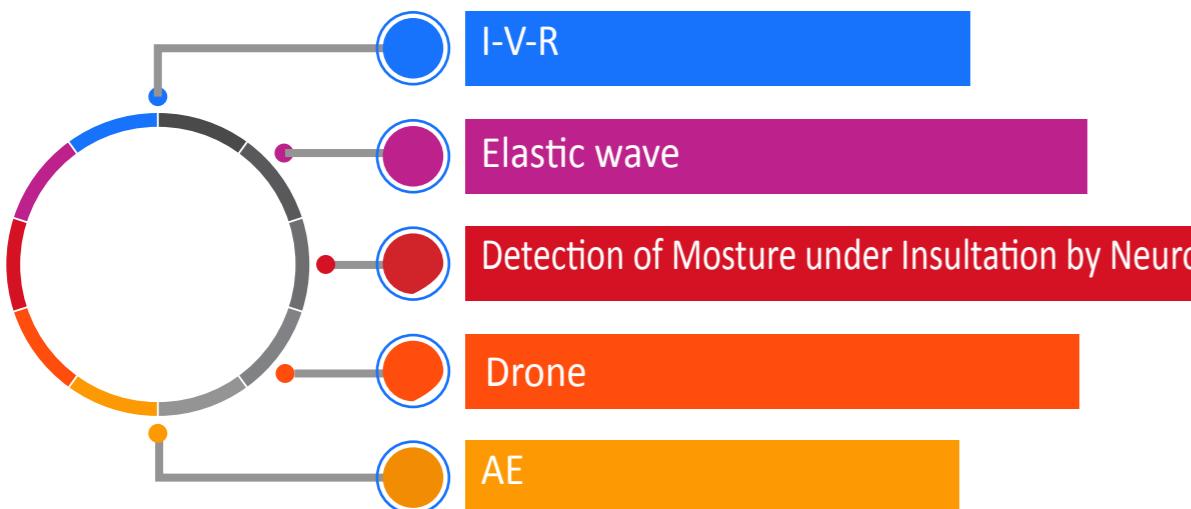
- 16** SOP for field emission scanning electron microscope (FESEM)

- 17** Procedure for Ultrasonic Inspection of Hardened Concrete

Senarai pangkalan data List of database



Senarai perisian List of software



46,546

Sijil / Laporan analisis yang dikeluarkan oleh kemudahan utama

Analysis certificates / Reports issued by main facilities

3776

Sijil Tentukuran

626

Sijil Ujian Kebocoran

53

Sample Analysis Result

4560

Laporan Dos Lencana TLD & Cip TLD

30000

Laporan Dos OSL

114

Sijil Laporan Analisis Khidmat Luar

80

Sijil Laporan Analisis Khidmat Dalaman

2971

Sijil dan Laporan Analisis Makmal RAS

3,776

Sijil Tentukuran Alat-alat Meter Tinjau

27

Sijil Tentukuran Dosimeter Ceric-Cerous

345

Sijil Tentukuran Alat-alat ujian Radiologi Diagnostik

41

Sijil Tentukuran Dose Calibrator

106

Sijil Kawalan Mutu (QC)
Radas Sinar-X
Perubatan

69

Sijil Ujian Ketebalan Kesetaraan Plumbum untuk bilik-bilik & kemudahan Penyinaran

2

Sijil Tentukuran Thyroid Counter



434

Jumlah Penerbitan Total Publication

15	Buku / Book
4	Bab dalam buku / Chapter in book
8	Tesis (Sarjana dan PhD) / Thesis – Hasilan staf Nuklear Malaysia / Output of Nuklear Malaysia's staff
21	Tesis (Sarjana dan PhD) / Thesis – Staf Nuklear Malaysia sebagai penyelia / Nuklear Malaysia's staff as a supervisor
80	Jurnal antarabangsa / International journal
6	Jurnal kebangsaan / National journal
97	Pembentangan antarabangsa / International presentation
110	Pembentangan kebangsaan / National conference
7	Penerbitan am antarabangsa / International general publication
74	Penerbitan am kebangsaan / Laporan teknikal National general publication / Technical report
12	Lain-lain penerbitan / Others publication



MERAKYATKAN TEKNOLOGI NUKLEAR HUMANISING NUCLEAR TECHNOLOGY

Projek MSI MSI Project

Nuklear Malaysia sentiasa giat melaksanakan pelbagai projek bagi merakyatkan teknologi nuklear di Malaysia. Usaha ini dilaksanakan melalui inisiatif *MOSTI Social Innovation* (MSI). Menerusi projek MSI ini, masyarakat memperoleh manfaat bersama khususnya bagi meningkatkan tahap sosioekonomi mereka ke arah yang lebih baik. Pelaksanaan projek MSI yang telah dijalankan adalah berdasarkan kepada kepakaran dan pengalaman pegawai penyelidik berserta kemudahan yang dimiliki di agensi ini.

Nuklear Malaysia has actively involved in MOSTI Social Innovation (MSI) projects. Through MSI project, communities get mutual benefits, especially in enhancing their socio-economic levels in a better condition. Implementation of the MSI project has been based on the expertise and experience of research officers as well as the facilities owned by this agency.



Kemudahan berteknologi tinggi rumah pengeluaran benih cendawan Volvariella (*High-Tech Facilities for Production House of Volvariella Mushroom Spawn*)
Home technological facility of Volvariella mushroom seed production (*High-Tech Facilities for Production House of Volvariella Mushroom Spawn*)



Pakej penanaman mutan tanaman hiasan untuk penjanaan ekonomi baru bagi komuniti Kampung Bundu Tuhan, Ranau, Sabah

Planting package of mutant plants to generate new economy for community at Bundu Tuhan Village, Ranau, Sabah



Pakej penanaman stevia untuk penjanaan ekonomi baru bagi komuniti di Tuaran, Sabah
Stevia planting package to generate new economy for community at Tuaran, Sabah

PENGURUSAN HARTA INTELEK INTELLECTUAL PROPERTY MANAGEMENT

Tiga Jenis Paten

Three Types of Pattern

Nuklear Malaysia telah berjaya memperolehi tiga jenis paten.
Nuklear Malaysia has been granted three types of patent.

Nama Paten/ Patent Name	Patent/ Paten	Tarikh perolehi/ Date of grant
1 <i>An Improved Thermal Processing Apparatus</i>	MY-160078-A	15 Februari 2017
2 <i>An Improved Composition Containing Polyvinyl-Chloride</i>	MY-161626-A	28 April 2017
3 <i>An Ultraviolet Curable Resin Composition And Method Thereof</i>	MY-160885-A	31 Mac 2017

Pencapaian Inovasi

Innovation Achievement

Program / Programme	Pingat/Award	Tajuk/Title
Malaysian Technology Expo (MTE) 2017	Emas : 2 Perak : 2 Gangsa:1	<u>Emas / Gold :</u> 1. <i>Radiation Compatible TPE Compounds for Healthcare Applications.</i> 2. <i>Acoustics Emission : Advance Non-Destructive Testing for Pressure Vessel Inspection</i> <u>Perak / Silver :</u> 1. Smart Survey Meter 2. Smart Radiation Monitoring System (SRM SYSTEM) <u>Gangsa / Bronze:</u>
28 th International Invention, Innovation and Technology Exhibition (ITEX 2017)	Emas : 2 Perak : Gangsa:-	Volvariella Tea – New Beverage from Volvariella Volvacea Mushroom
Innovation Competition UTP	2 penyertaan	
Anugerah Inovasi Perdana Menteri	1 penyertaan	
Anugerah Hari Intelek Negara 2017	4 penyertaan • Dr. Mek Zah Salleh • En. Sofian Alias • Pn. Nurul Huda • En. Zaifol Samsu	
Hari Inovasi Nuklear Malaysia	Emas : 4 Perak : 7 Gangsa: 10	



Pemenang Hari Inovasi Nuklear Malaysia
Winner of Nuklear Malaysia Innovation Day



PENGKOMERSIALAN DAN PEMINDAHAN TEKNOLOGI

COMMERCIALISATION AND TECHNOLOGY TRANSFER

Khidmat Profesional

Jumlah Pendapatan daripada Khidmat Profesional

Nuklear Malaysia menjana pendapatan sebanyak RM10.38 juta melalui khidmat profesional yang diberikan kepada pelanggan sepanjang tahun 2017. Sebanyak 19 khidmat teknikal merupakan penyumbang tertinggi diikuti oleh pembekalan produk dan khidmat latihan. Sebahagian kecil pendapatan diperolehi daripada kontrak/geran penyelidikan/runding cara dan dividen dari pelaburan.



Professional Services

Revenue from Professional Services

Nuklear Malaysia generated revenue total RM10.38 million from profesional services provided to all customers in 2017. There are 19 technical services contibuted the higheres revenue followed by product supply and training. Others revenues are form contract/research grant/consultation and dividen from investment.

BIL NO.	SUMBER PENDAPATAN SOURCE OF REVENUE	JUMLAH PENDAPATAN (RM/JUTA) TOTAL OF REVENUES (RM/MILLION)
1.	Bekalan Produk Product Supply	2.75
2.	Latihan Training	2.72
3.	Perkhidmatan Teknikal Technical Services	4.25
4.	Kontrak/Geran penyelidikan/ Runding cara Contract/Research Grant/Consultation	0.54
5.	Dividen Daripada Pelaburan Dividen from Investment	0.12

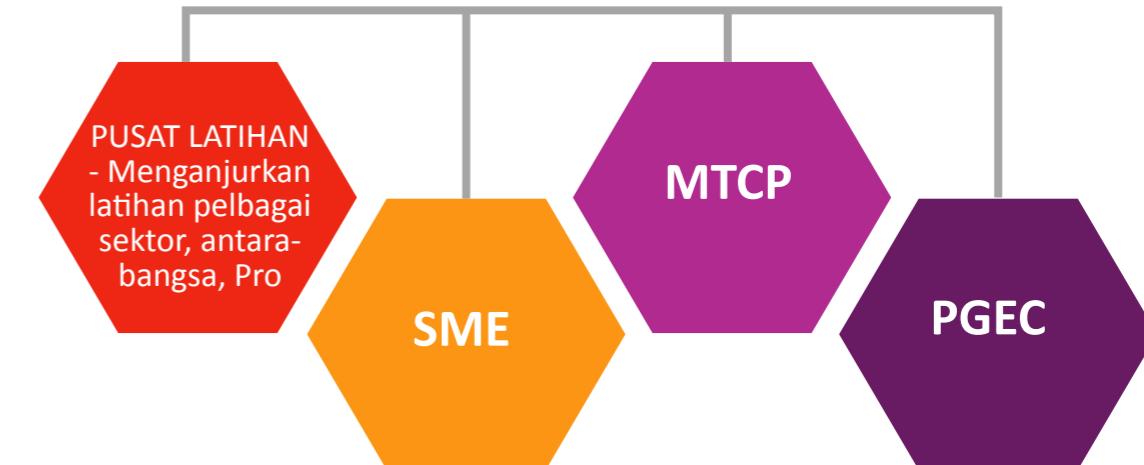
Jenis-jenis Khidmat Profesional

Types of Professional Services

- 01 Makmal Standard Dosimetri Sekunder (SSDL)
- 02 RAYMINTEX - Loji Prapemvulkanan Lateks Getah Asli Menggunakan Sinaran Gama (RVNRL)
- 03 Pusat Pemprosesan Radioisotop (BRI)



Pendidikan dan Latihan Education and Training





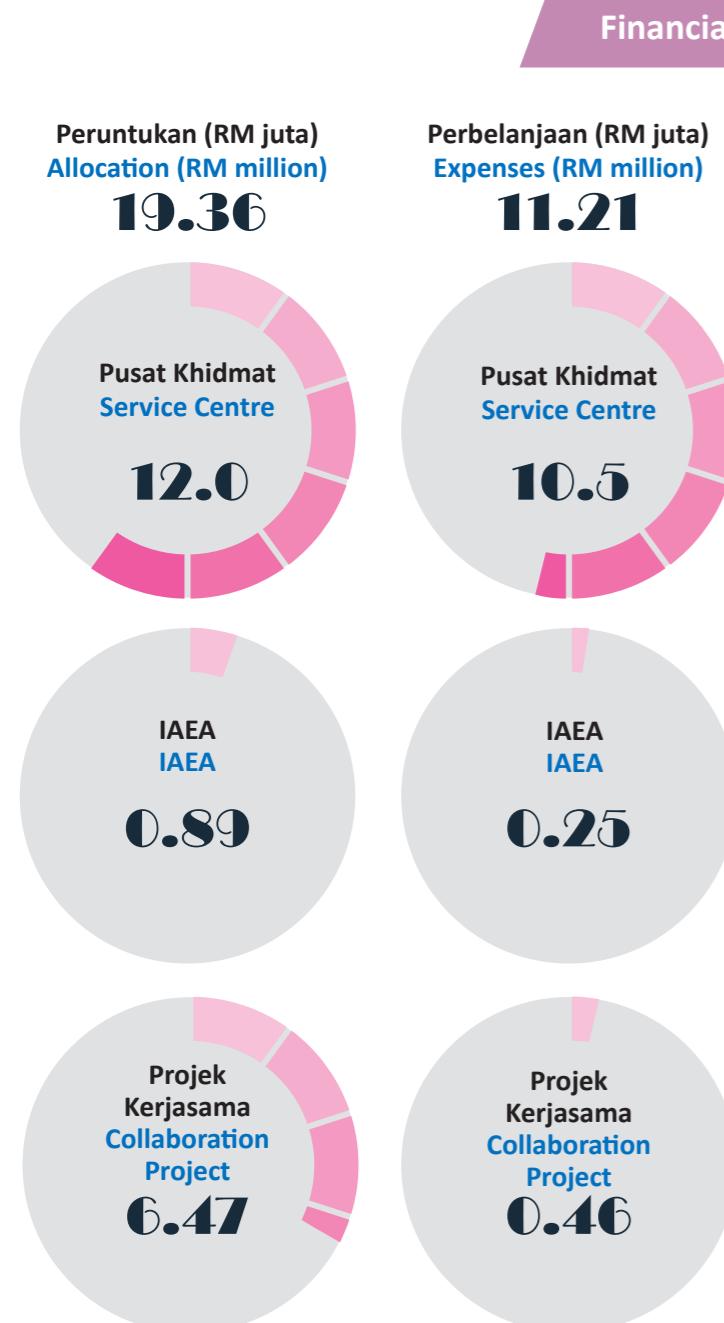
Perkhidmatan Teknikal Technical Services

- 1.** Fizik Perubatan (KFP)
- 2.** Kimia Analisa (ACA)
- 3.** Analisa Radiokimia & Alam Sekitar (RAS)
- 4.** Makmal Teknologi Sinaran (MTS)
- 5.** Kumpulan Analisa Bahan (MTEG)
- 6.** Ujian Tanpa Musnah (NDT)
- 7.** Pelupusan Sisa Radioaktif (WASTEC)
- 8.** Ujian Biologi dan Biodose (BIOTEST)
- 9.** Loji Penyinaran Sinagama (SINAGAMA)
- 10.** Loji Penyinaran Alurtron (ALURTRON)
- 11.** Instrumentasi & Automasi (PIA)
- 12.** Pembangunan Prototaip dan Loji (PDC)
- 13.** Loji Sterifeed / Bioproses (TAB)
- 14.** Makmal Radiasi Tidak Mengion (NIR)
- 15.** Teknologi Penilaian Loji (PAT)
- 16.** Aplikasi Penyuruh Sekitaran (e-TAG)
- 17.** Fizik Kesihatan (KFK)
- 18.** Pengkomersilan Teknologi (BKT)
- 19.** Pusat Teknologi Reaktor (PTR)



- 1** Pengukuran aras frekuensi radio (RF) di struktur menara telekomunikasi
RF measurement at telecommunication tower structure
- 2** Pengendalian pembuatan produk radiofarmaseutikal
Production of radiopharmaceutical product
- 3** Analisa sampel di makmal RAS
Sample analysis at RAS labotary
- 4** Pengukuran dos sinaran di makmal SSDL
Measurement of radiation dose at SSDL

Prestasi Kewangan Akaun Amanah



Nuklear Malaysia telah menerima peruntukan sebanyak RM19.36 juta bagi pusat khidmat, projek IAEA dan projek kerjasama. Jadual dibawah menunjukkan peratus prestasi kewangan yang telah dicapai.

Nuklear Malaysia has received an allocation of RM20 million for the service centre, IAEA and collaboration projects. Table below shows the percentage of financial performance that has been achieved.

Produk Komersial

Platform (MCY2.0)	Tahun (MCY2.0)	Pengkomersialan (MCY2.0)	Malaysia (MCY2.0)
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Inisiatif Tahun Pengkomersialan Malaysia yang dilaksanakan secara NBOS di antara MOSTI dan Kementerian Kewangan (MOF) menggariskan projek-projek penyelidikan yang dapat melonjakkan aktiviti inovasi dan pengkomersilan di semua sektor dan di semua lapisan masyarakat di Malaysia. Pelaksanaannya memerlukan komitmen, kerjasama dan sokongan dari semua pihak dalam landskap STI kebangsaan. Sejumlah lima projek penyelidikan Nuklear Malaysia dilaksanakan di bawah inisiatif ini.

Commercial Products

Malaysia (MCY2.0)	Commercialisation Year	Platform
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Malaysia Commercialisation Year initiative which is implemented by NBOS between MOSTI and Ministry of Finance (MOF) outlines project research that can boost innovation and commercialization activities in all sectors and at all walks of life in Malaysia. Its implementation needs commitment, cooperation and support from all parties in the national STI landscape. A total of five Nuklear Malaysia's research projects were implemented under this initiative.

Hasil penyelidikan yang dikomersialkan di bawah inisiatif MCY2.0 Research output commercialised under MCY2.0 initiative

- 1 Baja Baja Baru Bioliquifert Cendawan Biofertiliser 'Bioliquifert'
- 2 Baka Baru Cendawan Volvariella New Strains of Volvariella Mushroom New Variety
- 3 Khidmat Pemetaan Kesuburan Tanah menggunakan Teknik GEM-2 Soil Fertility Mapping Service using GEM-2 Technic
- 4 Sistem 'Smart Alert Radiation Monitoring' 'Smart Alert Radiation Monitoring' System
- 5 Sangkar Akuakultur Aquaculture Cage



Baja Bioliquifert
Biofertiliser 'Bioliquifert'



Penanaman cendawan volvariella oleh komuniti
Planting of volvariella mushroom by community



Pemetaan kesuburan tanah menggunakan
teknik GEM-2
Soil fertility mapping service using GEM-2 technic



Sangkar akuakultur berdasarkan komposit berhibrid
Aquacultur cage from hybrid composite



Sistem SARM yang diaplikasikan di Nuklear
Malaysia
Application of SARM System in Nuklear Malaysia

Pelancaran Produk

Product Launching



Sempena Hari Inovasi Nuklear Malaysia 2017, dua produk baru penyelidikan Nuklear Malaysia telah dilancarkan iaitu :

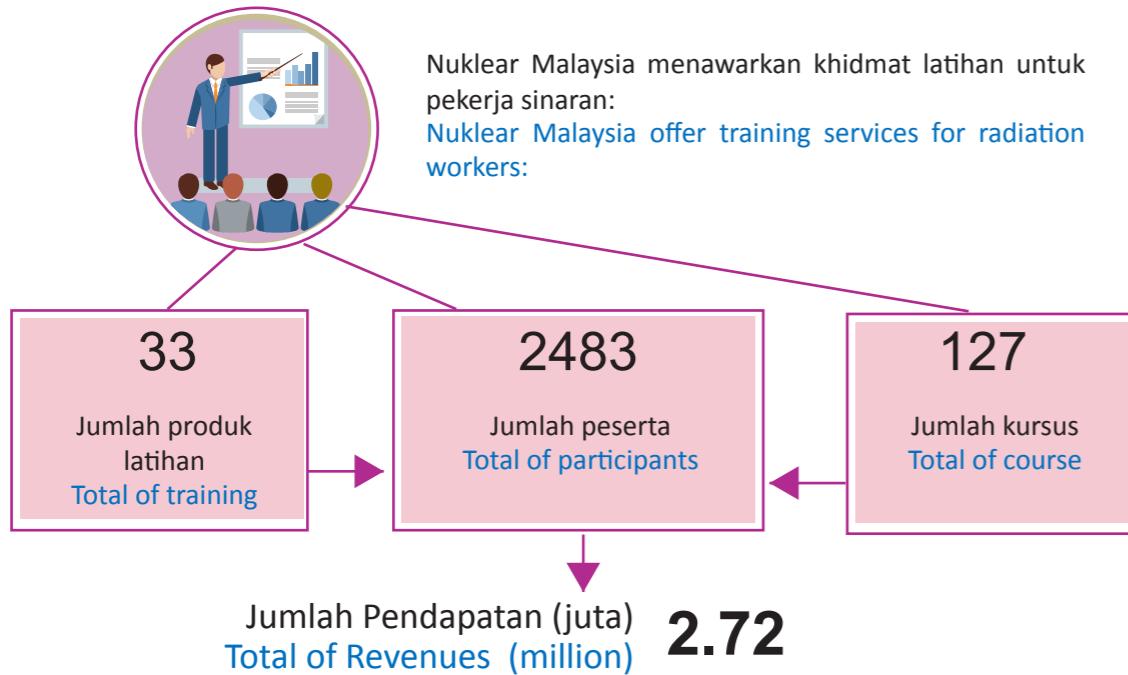
Two products form new R&D have been launched during Hari Inovasi Nuklear Malaysia 2017 :

- 1** Sistem 'Smart Alert Radiation Monitoring'
'Smart Alert Radiation Monitoring' System

- 2** Baka Baru Mushroom Volvariella
New Strains of Volvariella Mushroom



Pelancaran produk sempena Hari Inovasi Nuklear Malaysia 2017
Product launching at Hari Inovasi Nuklear Malaysia 2017

Khidmat Latihan**Training Services**

Persidangan dan Bengkel Pelindungan Sinaran yang diadakan di The Zenith Hotel, Kuantan
Radiation Workshop and Conference at The Zenith Hotel, Kuantan



Seminar Keselamatan Makanan yang diadakan di Hotel Le Meridien, Putrajaya
Safety Food Seminar at Hotel Le Meridien, Putrajaya

Produk /Perkhidmatan Pasaran Antarabangsa**Product / Services Overseas Market**

- 1** Calibration radiation measuring instrument (survey meter/ Ionization Chamber calibration)
- 2** High Dose Dosimetry for Industrial Application
- 3** Ceric-Cerrous
- 4** TLD Personal Dosimetry
- 5** OSL Personal Dosimetry



a. Senarai Perjanjian Kerjasama

[List of Memorandum of Agreements \(MoA\)](#)

BIL. NO.	TAJUK PROJEK PROJECT TITLE
1.	Projek Kerjasama Penganjuran Latihan Dalam Bidang Ujian Tanpa Musnah (NDT) Tahap 2
2.	Projek Kerjasama Penganjuran Latihan Bagi Kursus-Kursus Keselamatan dan Kesehatan Pekerjaan
3.	Pengkomersian Produk Bioliquifert
4.	Pengkomersian Teknologi Sistem ‘Smart Alert Radiation Monitoring (SARM)’

b. Senarai Perjanjian Kerahsiaan

[List of Non-disclosure Agreements \(NDA\)](#)

BIL. NO.	TAJUK KERJASAMA TITLE OF COLLABORATION
1.	Pengkomersian Teknologi Bioreaktor untuk Coklat Tongkat Ali dan Ginseng
2.	Projek Kerjasama Pengkomersian Anak Benih Kultur Tisu Pisang dan Nenas
3.	Pengkomersian Teknologi Aluminium Sacrificial Anode for Cathodic Protection

- | | |
|----|---|
| 4. | Commercialisation and Technology Transfer of Thermal Treatment Equipment to Centre of Excellence (COE) |
| 5. | Pengkomersian Produk Sinorama Gaharu Pellets |
| 6. | Pengkomersian Teknologi Sistem ‘Smart Alert Radiation Monitoring (SARM)’ |
| 7. | Pengkomersian Produk berdasarkan Cendawan Volvariella |
| 8. | Projek Kerjasama Pemantauan Sinaran Frekuensi Radio (RF) bagi Struktur Pemancar Telekomunikasi di Melaka |
| 9. | Projek Kerjasama Pemantauan Sinaran Frekuensi Radio (RF) bagi Struktur Pemancar Telekomunikasi di Sarawak |



Majlis Pertukaran Dokumen Perjanjian Kerjasama antara Nuklear Malaysia dan ZL Technologies Sdn. Bhd.
Exchange of Memorandum of Agreements between Nuklear Malaysia and ZL Technologies Sdn. Bhd.



Program Promosi dan Pemasaran

Promotion and Marketing Program

Nuklear Malaysia bergiat aktif dalam pameran di peringkat kebangsaan dan antarabangsa yang dianjurkan oleh SME Corporation Malaysia, MOSTI dan institusi lain. Senarai pameran yang disertai seperti dalam jadual di bawah.

Nuklear Malaysia has actively involved in exhibitions at national and international levels organised by SME Corporation Malaysia, MOSTI and other institutions. The list of exhibitions participated is shown in table below.

Senarai pameran yang disertai oleh Nuklear Malaysia
List of exhibitions participated by Nuklear Malaysia

Bil. No.	Pameran Exhibition
1.	BioMalaysia 2017 pada 11–13 September 2017 di Kuala Lumpur Convention Center (KLCC) anjuran Malaysia BioEconomy Development Corporation Sdn. Bhd.
2.	Eksspo NICE2017 pada 11 – 16 Oktober 2017 di Technology Park Malaysia (TPM), Bukit Jalil anjuran MOSTI
3.	Pameran Produk & Khidmat sempena Hari Inovasi Nuklear Malaysia pada 16–17 November 2017 di Agensi Nuklear Malaysia
4.	Pameran The 13th World Islamic Economic Forum (WIFE) pada 21 – 23 November 2017 di Kuching, Sarawak



Penerangan mengenai analisa sampel radiokimia pada pameran di NICE
Briefing on radiochemical sample analysis at NICE exhibition



Pameran produk dan khidmat Nuklear Malaysia sempena Hari Inovasi Nuklear Malaysia
Product and services exhibition during Hari Inovasi Nuklear Malaysia

PERKHIDMATAN TEKNIKAL DAN SOKONGAN

TECHNICAL SERVICES AND SUPPORT

Kemudahan Alurtron

Alurtron Facilities



Kemudahan ALURTRON
ALURTRON Facility

Kemudahan Alurtron menyediakan rawatan iradiasi alur elektron kepada wayar, kabel dan tiub untuk tujuan pentautan silang; alat peranti elektronik untuk penampaikan spesifikasi elektronik alat dan produk R&D untuk pelbagai tujuan. Alurtron memiliki persijilan ISO 9001:2008 dan ke arah persijilan ISO 9001:2015 pada September 2018, dan diperlesenkan di bawah lesen LPTA/A/724.

The Alurtron facility provides electron beam irradiation treatment to wires, cables and tubes for cross-purpose purposes; electronic device for electronic gadget enhancement of R&D tools and products for various purposes. Alurtron has the ISO 9001: 2008 certification and towards ISO 9001: 2015 certification in September 2018, and licensed under the LPTA / A / 724 license.

Mesin alur elektron EPS 3000 yang dimiliki berupaya untuk merawat wayar, kabel dan tiub secara komersil dengan bantuan sistem penghantar WUBHS (Wire Under Beam Handling System) pertama seumpamanya di Malaysia. Sehingga ini, Alurtron telah membantu industri wayar, kabel dan tiub tempatan dalam penghasilan tiub kecut haba dan wayar automotif dan mendominasi masa pengoperasian sebanyak 65%.

The EPS 3000 electron beam machine is capable of treating wires, cables and tubes commercially with the help of the first WUBHS (Wire Under Beam Handling System) conveyor system in Malaysia. To this end, Alurtron has assisted the local wires, cables and tubes industry in the production of heat-shrink tubes and automotive wires and dominated operating time by 65%



Selain itu, Alurtron telah merawat peranti elektronik semikonduktor semenjak 2014 dan merupakan penyumbang terbanyak, 75% dalam pendapatan Alurtron. Tahun 2017, rawatan produk semikonduktor ini mencatatkan jumlah pendapatan tertinggi berbanding tahun-tahun sebelum itu.

Dari segi kualiti, Makmal Kualiti Alurtron menyokong kerja-kerja iradiasi dengan menyediakan ujian dosimetri bagi menentukan dos serapan oleh produk adalah dipenuhi selain kawalan kualiti sepanjang proses iradiasi.

In addition, Alurtron has been treating semiconductor electronic devices since 2014 and is the largest contributor, 75% in Alurtron revenue. In 2017, the treatment of this semiconductor product recorded the highest amount of revenue compared to previous years.

In terms of quality, the Alurtron Quality Laboratory supports irradiation works by providing dosimetry tests to determine the absorption dose of the product is fulfilled besides quality control throughout the irradiation process.

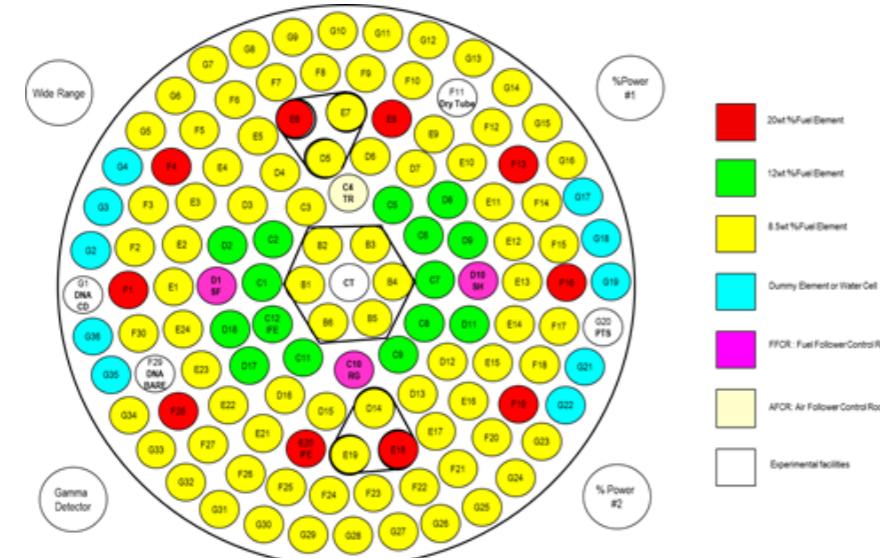
TEKNOLOGI REAKTOR

REACTOR TECHNOLOGY

Reaktor Triga Puspati

Reaktor TRIGA PUSPATI (RTP) direkabentuk untuk melaksana pelbagai bidang penyelidikan dan pendidikan nuklear dengan efektif. Ia menggabungkan beberapa kemudahan untuk melakukan kajian sinaran neutron dan gama termaju seperti penghasilan radioisotop, pengaktifan sampel dan melatih pelajar. Reaktor mencapai krikital yang pertama pada 28 Jun 1982 dengan kuasa nominal 1MWt. Pada peringkat ini, hanya 66 elemen bahan api U-235 digunakan selebihnya menggunakan replika grafit. Kini, konfigurasi teras RTP ke-15 terdiri daripada 111 elemen bahan api dengan campuran 8.5wt%, 12wt% dan 20wt% unsur uranium-235, lima kemudahan penyinaran teras dan beberapa unsur replika grafit.

The Reactor TRIGA PUSPATI (RTP) was designed to effectively implement the various fields of basic nuclear research and education. It incorporates facilities for advanced neutron and gamma radiation studies as well as isotope production, sample activation and student training. The reactor reached its first criticality on 28th June 1982 at nominal power of 1MWt. The initial core consists of only 66 U-235 fuel elements and few graphite dummy elements. The current 15th core configuration consists of 111 fuel elements with a mixture of 8.5wt%, 12wt% and 20wt% uranium-235, five in-core irradiation facilities, and few graphite dummy elements.



Reactor Triga Puspati

Bahan Api Nuklear RTP

RTP menggunakan elemen bahan api pepejal yang dibangunkan oleh General Atomic di mana moderator zirkonium-hidrida secara homogen digabungkan dengan uranium yang dipertingkatkan. RTP telah membeli 129 bahan api nuklear pada tahun 1980-an, di mana 122 telah digunakan dalam teras reaktor. Pada masa ini, pembakaran purata U-235 dalam bahan api nuklear RTP dikira sekitar 15% manakala pembakaran tertinggi adalah kira-kira 35%. Secara umum, bahan api nuklear ini tidak lagi digunakan dalam teras reaktor apabila mencapai 50% pembakaran.

RTP Nuclear Fuel Elements

RTP uses solid fuel elements developed by General Atomic in which the zirconium-hydride moderator is homogeneously combined with enriched uranium. RTP have bought 129 nuclear fuels in 1980s, which 122 have been used in reactor core. At present, the average burn up of U-235 in RTP nuclear fuels was calculated around 15% whereas the highest burn up is about 35%. In general, these nuclear fuels will be no longer used in reactor core when its reach 50% burn up.

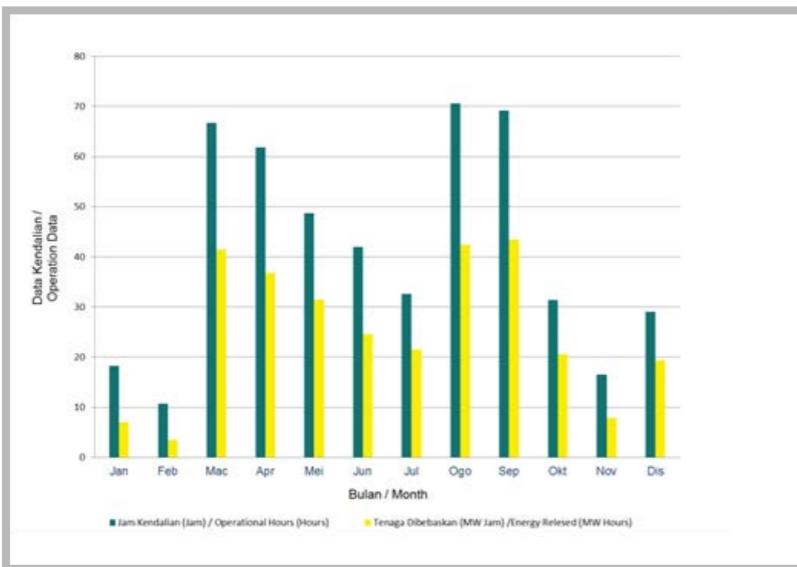


Kendalian Reaktor

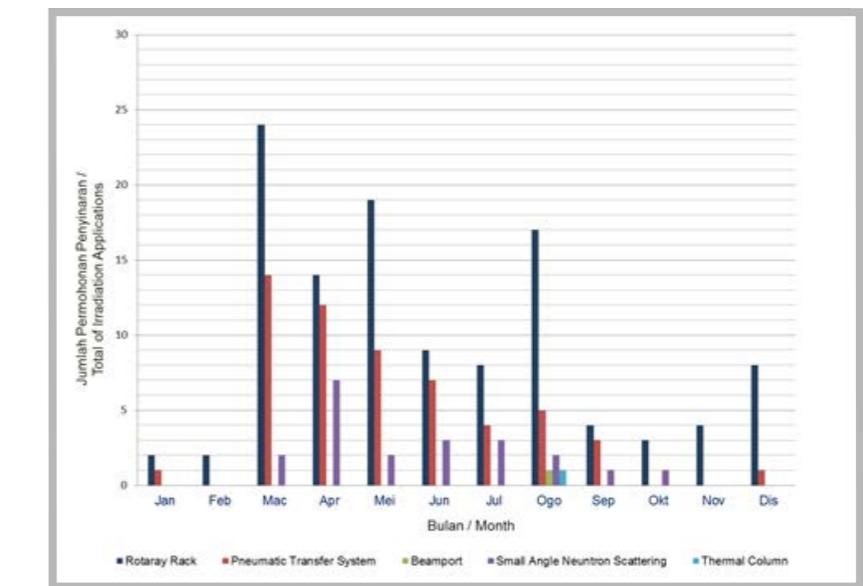
Reaktor TRIGA PUSPATI telah dikendalikan dengan selamat sepanjang pengoperasian iaitu dengan jumlah terkumpul sebanyak 497 jam dan pembebasan tenaga 299 MWjam pada tahun 2017.

This reactor has been operated safely for a cumulative operating time of 497 hours and energy released of 299 MWhours in 2017.

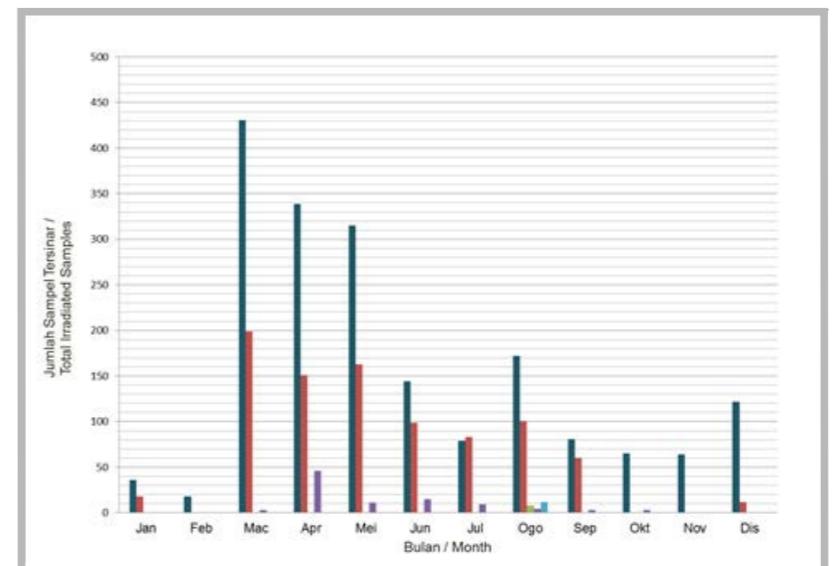
Reactor Operation



Data kendalian dan tenaga terbebas dari Januari hingga Disember 2017
RTP Operation and energy released data from January to December 2017



Jumlah permohonan penyinaran sampel di RTP dari Januari hingga Disember 2017
Total applications for sample irradiation at RTP from January to December 2017



Jumlah sampel tersinar di RTP dari Januari hingga Disember 2017
Total irradiated samples at RTP from January to December 2017

Penyenggaraan Reaktor

Penyenggaraan reaktor dilakukan dua kali setahun bagi memenuhi pematuhan lesen yang dikeluarkan oleh LPTA. Pada 2017, penyenggaraan tahunan diadakan pada 20 Januari hingga 24 Februari dan 3 hingga 14 Julai.



Pemeriksaan visual bahan api nuklear
Nuclear fuel visual inspection

Reactor Maintenance

The maintenance is performed twice in a year to comply the licence requirement issued by AELB. In 2017, the annual maintenance and semi-annual maintenance were held on 20 January to 24 February and 3 to 14 July, respectively



Pensampelan air sistem primer RTP bagi menentukan kepekatan radionuklid dalam bahan penyejuk reaktor (tutup label botol)
Sampling of RTP primary water to determine the radionuclides concentration in reactor coolant



Pemeriksaan kebocoran sinaran di kemudahan alur sinar RTP
Radiation leak test inspection on RTP beamport



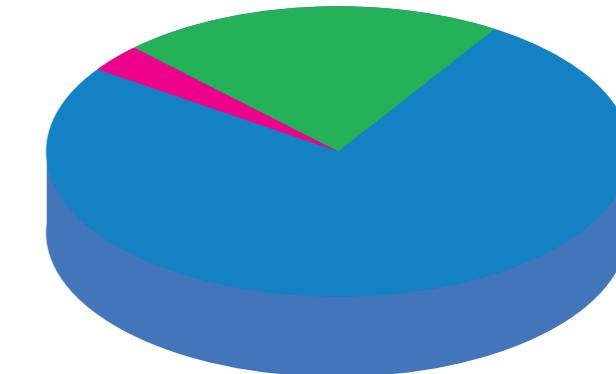
Pemeriksaan sistem mekanikal kemudahan penyinaran rak berputar
Inspection of the rotary rack irradiation facility mechanical system

Pelawat RTP

RTP merupakan kemudahan utama yang terdapat di Nuklear Malaysia yang kerap menerima pelawat. Sejumlah 1529 orang pelawat daripada pelbagai latar belakang seperti agensi kerajaan, syarikat swasta, pelajar universiti, peserta kursus dan pelawat luar negara telah melawat pusat kemudahan ini pada 2017.

RTP is one of the main facilities in Nuklear Malaysia which regularly receives visitors. A total of 1529 people from government agencies, private companies, university students, course participants and foreign visitors have visited this facility on 2017.

- Pelajar Universiti
University Students
- Pelawat Luar Negara
Foreign Visitor
- Agensi Kerajaan dan
Syarikat Swasta
Government Agencies
and Private Company





Kunjungan hormat Tan Sri Dato' Ir. Dr. Ahmad Tajudin Ali ke RTP
RTP visit by Tan Sri Dato' Ir. Dr. Ahmad Tajudin Ali



Pelawat daripada Universiti Malaysia Terengganu, UMT
Visitors from Universiti Malaysia Terengganu, UMT



Pelawat daripada Universiti Tenaga Nasional, UNITEN
Visitors from Universiti Tenaga Nasional, UNITEN

Program Latihan dan Amali Reaktor

Educational Training and Practical Programme in Reactor



1



3



2



4

Pembangunan Teknologi Kuasa Nuklear

Development of Nuclear Power Technology



- 1** Sesi Amali Pelajar Kursus Pengenalan Kejuruteraan Nuklear, Universiti Tenaga Nasional (UNITEN) di RTP
Practical Session by Introduction on Nuclear Engineering Course Students, UNITEN, at the RTP
- 2** Penerangan eksperimen kepada para pelajar sarjana muda sains kejuruteraan nuklear, UTM
Briefing on experiment to students of Bachelor of Science in Nuclear Engineering, UTM
- 3** Eksperimen kendalian reaktor penyelidikan menggunakan simulasim konsol RTP
Experiment on research reactor operation using RTP console simulator
- 4** Eksperimen penentuan spektrum neutron yang terserak keluar daripada alur sinar RTP
Experiment on determination of neutron spectrum scattered from RTP
- 5** Para pelajar mendapat pendedahan berkaitan sistem penyejuk RTP
Students are familiarising with the RTP cooling system
- 6** Eksperimen Analisis Pengaktifan Neutron (NAA) menggunakan pengesan HP-Ge
Experiment on Neutron Activation Analysis (NAA) using HP-Ge detector



Mesyuarat Persediaan Projek Limited Scope NESa of Small Modular Reactor (SMR) di Malaysia

Preparatory Meeting on the Project on Limited Scope NESa of Small Modular Reactor (SMR) in Malaysia



Pendedahan kepada pengoperasian loji kuasa nuklear dan analisis kemalangan menggunakan simulator NPP
Familiarisation of nuclear power plant operation and accident analysis using NPP simulator



KESELAMATAN & KESIHATAN PEKERJAAN

OCCUPATIONAL SAFETY AND HEALTH

Perkhidmatan yang ditawarkan adalah untuk memastikan keselamatan dan kesihatan pekerja mahupun alam sekitar sentiasa berada pada tahap yang optimum. Bagi memperkasa bidang keselamatan, sekuriti dan kawal selia, Nuklear Malaysia telah menjalankan kerjasama dengan Lembaga Perlesenan Tenaga Atom (LPTA), Jabatan Keselamatan dan Kesihatan Pekerjaan (JKKP) dan Jabatan Alam Sekitar (JAS).

Nuklear Malaysia offers technical services in the field of radiation safety and health. The services offered are to ensure that the safety and health of workers and the environment are always at an optimal level. In order to achieve this, Nuklear Malaysia has worked with the Atomic Energy Licensing Board (AELB), the Department of Occupational Safety and Health (DOSH) and Department of Environment (DOE).

Perkhidmatan Teknikal Keselamatan & Kesihatan

Technical Service for Safety and Health

KLUSTER / CLUSTER	AKTIVITI / ACTIVITY	PENCAPAIAN / ACHIEVEMENT
Lesen & Sistem Keselamatan	<ul style="list-style-type: none"> *Pendaftaran SSDL, WASTEC, dan Tambahan Lesen H selenggara sendiri di bawah LPTA/A/724 *Pematuhan lesen KKM/R/0054 *Kemalangan sifar mengikut kategori (Chemical, Biological, Radiation) *Latih amal kecemasan <ul style="list-style-type: none"> 1) Latihan radiologi & sekuriti reaktor 2) Latihan memadam kebakaran 	

KLUSTER / CLUSTER	AKTIVITI / ACTIVITY	PENCAPAIAN / ACHIEVEMENT
Sistem Pengurusan	<ul style="list-style-type: none"> *ISO 17020: Makmal NIR *ISO 17025: Makmal fizik perubatan *ISO 17025: SSDL 	<ul style="list-style-type: none"> 85% audit dijalankan ISO dikekalkan Penggabungan dokumen
Khidmat Teknikal	<ul style="list-style-type: none"> *Anggaran: 1500 *Anggaran: 1000 <ul style="list-style-type: none"> 1. KFP <ul style="list-style-type: none"> i) Tentukuran QC ii) Lead Equivalent thickness iii) Dose calibrator 2. SSDL <ul style="list-style-type: none"> i) Tentukuran meter tinjau ii) High Dose - CECE iii) OSL dan TLD 	<ul style="list-style-type: none"> Tentukuran alat perubatan KMS:342 Pendapatan KFK: RM 353,576 NIR: RM 240,000 SSDL: RM 2,835,563.29 KFP : RM 272,354.17 <ul style="list-style-type: none"> 1. KFP <ul style="list-style-type: none"> i) Tentukuran QC: 101 alat ii) Lead Equivalent thickness : 67 bilik iii) Dose calibrator: 41 unit 2. SSDL <ul style="list-style-type: none"> i) Tentukuran meter tinjau :3,505 ii) High Dose - CECE: 10.533 iii) OSL : 162,422 iv) TLD : 14,853

KLUSTER / CLUSTER	AKTIVITI / ACTIVITY	PENCAPAIAN / ACHIEVEMENT
	Tentukuran peralatan ujian kawalan mutu radiologi diagnostik (<i>Calibration of test equipment used in the quality control test in diagnostic radiology</i>)	342
	Ujian kawalan mutu radas penyinaran sinar-X (<i>Quality control test for X-ray irradiating apparatus</i>)	101
	Ujian ketebalan kesetaraan plumbum bilik penyinaran (<i>Lead equivalent thickness testing for irradiation room</i>)	67
	Tentukuran penentukur dos (<i>Calibration of dose calibrator</i>)	41
	Tentukuran meter tinjau (<i>Calibration of survey meter</i>)	3505
	Pembekalan OSLD (<i>Supply of OSLD</i>)	162,422
	Pembekalan TLD (<i>Supply of TLD</i>)	14,853
	Pembekalan dosimeter aras tinggi 'ceric-kerous' (<i>Supply of ceric-kerous high dose dosimeters</i>)	10533
	Ujian kebocoran punca terkedap (<i>Leak testing services for sealed source</i>)	1016
	Penilaian Aras Sinaran Frekuensi Radio (RF) yang dihasilkan oleh Struktur Pemancar Telekomunikasi (<i>Radiofrequency (RF) Radiation Level Assessment Emitted by Telecommunication Structure System</i>)	50

a) Projek Sedia Ada / Current Project

1. Thorium w/ BTI (perlesenan 50%)
2. Science fund source tracking (100%)
3. Cyclotron (KIV)
4. Int. Dosimetry (WBC 100%)
5. BOSS w/ BAS (50%)
6. FTC NREP w/ JAEA (100%)
7. Projek penyelarasan dan pengurusan lesen LPTA/A/724 (70%)
8. ISO 17025-KFP (Digabung dengan SSDL) (50%)
9. ISO 17020-NIR (Menunggu External audit dari JSM (80%)
10. ISO SSDL (Digabung dengan SSDL) (50%)
11. Mobile lab (100%)
12. Radiotherapy (100%)
13. RF database (70%)
14. Techno fund SSDL (Projek ditamatkan)

b) Projek Baru / New Project

1. Projek pemonitoran Radon di Lynas (60%)
2. Development of EMF probe
3. EMF transportation 2016 w/ NIR
4. Telekom (Projek ditamatkan)
5. Projek Radon gempa bumi Sabah (Projek ditamatkan)
6. Project RF Assessment Rexacon (80%)
7. Project RF Assessment SACOFA (75%)

HUBUNGAN & KERJASAMA ANTARABANGSA

INTERNATIONAL RELATIONS AND COOPERATION

Nuklear Malaysia mempunyai kerangka kerjasama serantau dan antarabangsa dalam pelbagai bidang penyelidikan bagi menyokong pembangunan sains dan teknologi nuklear secara aman di Malaysia.

- misi pakar
- projek IAEA Kebangsaan & Antarabangsa
- program fellowship
- lawatan saintifik,
- penyertaan dan penganjuran persidangan
- mesyuarat teknikal
- seminar/bengkel/kursus

Nuklear Malaysia has the framework of regional and international cooperation in various fields of research. This bilateral cooperation aims to support the development of nuclear science and technology for peaceful use in Malaysia.

- expert missions
- International & National IAEA Projects
- fellowship programs
- scientific visits
- participation and organisation of conferences,
- technical meetings
- seminars/workshops/courses.

Seminar Kesedaran CTBT
CTBT Awareness Seminar
23rd February

Mesyuarat Penyelaras FNCA ke-18
18th FNCA Coordinating Meeting
6th-8th March

Mesyuarat Perwakilan Kebangsaan RCA ke-39
39th RCA National Representative Meeting
3rd-6th April

Perjanjian RCA Instrument of Acceptance
Agreement of RCA
Instrument of Acceptance
20th June

Mesyuarat Jawatankuasa CTBT
CTBT Committee Meeting
23rd August

Penyertaan Delegasi Malaysia (Persidangan Agong IAEA)
Participation of Malaysian Delegations (IAEA General Conference)
18th-22nd September



Seminar Kesedaran CTBT
CTBT Awareness Seminar



Lawatan Teknikal Organisasi Antarabangsa Malaysian South-South Association (MASSA)
Technical Visit by International Organisation Malaysian South-South Association (MASSA)

Kecemerlangan Program Pengurusan direalisasikan pada tahun 2017 sejajar dengan misi, visi dan objektif Nuklear Malaysia. Program promosi seluruh negara diteruskan untuk memastikan pembangunan teknologi nuklear terus relevan. Sepanjang tahun 2017, pelbagai aktiviti dijalankan, antaranya adalah program hal ehwal kakitangan dan perjawatan, kewangan, perolehan dan aset, penerbitan dan media, pengurusan latihan kakitangan, keselamatan fizikal dan komunikasi korporat.

PROGRAM PENGURUSAN MANAGEMENT PROGRAMME

Management Program Excellence was realized in 2017 in line with Nuclear Malaysia's mission, vision and objective. The nationwide promotion program continues to ensure the continued development of nuclear technology. Throughout the year 2017 various activities were carried out, among them staff and employment affairs programs, finance, procurement and assets, publishing and media, staff training management, physical security and corporate communications.

MENGURUS

Peruntukan
81.50 juta

OPERATING

Allocation
81.50 million



PEMBANGUNAN

Peruntukan
16.79 juta

DEVELOPMENT

Allocation
16.79 million

