

LAPORAN TAHUNAN **2018** Annual Report



AGENSI NUKLEAR MALAYSIA
Kementerian Tenaga, Sains, Teknologi,
Alam Sekitar Dan Perubahan Iklim (MESTECC)

MALAYSIAN NUCLEAR AGENCY,
Ministry Of Energy, Science, Technology,
Environmental and Climate Change (MESTECC)

KANDUNGAN

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■ VISI *VISION*

Sains dan teknologi nuklear untuk penjanaaan ilmu, kemakmuran dan kesejahteraan masyarakat dan negara
Nuclear science and technology for creation of knowledge, prosperity and societal and national well-being

■ MISI *MISSION*

Meneraju kecemerlangan dalam penyelidikan dan penggunaan teknologi nuklear untuk pembangunan lestari
Excellence in research and applications of nuclear technology for sustainable development

■ OBJEKTIF *OBJECTIVES*

- Menjana produk dan teknologi baru melalui penyelidikan dan inovasi berdasarkan agenda pembangunan negara
 - *To generate new products and technologies through research and innovation based on the national development agenda*
- Mencapai pendapatan minimum 30% dari bajet mengurus tahunan menerusi pemindahan dan pengkomersialan teknologi
 - *To achieve an income, at minimum 30% of the annual operating budget, through transfer and commercialisation of technology*
- Meningkatkan kecemerlangan organisasi melalui perancangan dan pengurusan berkualiti
 - *To enhance organisational excellence through planning and quality management*

Laporan Ketua Pengarah

AGENSI NUKLEAR MALAYSIA

*Report by the Director General
Malaysian Nuclear Agency*

Setelah hampir lima dekad, Nuklear Malaysia telah banyak mempamerkan kejayaan sepanjang penubuhannya. Nuklear Malaysia berjaya mengekalkan identiti sebagai peneraju dalam bidang sains dan teknologi nuklear terutamanya dalam penyelidikan dan pembangunan, inovasi dan pengkomersialan teknologi nuklear.

Agensi ini bukan sekadar sebuah institusi penyelidikan kebangsaan yang berperanan untuk mempromosi, membangun dan menggalakkan penggunaan teknologi nuklear malah turut memberikan khidmat dan latihan kepakaran dalam bidang ini. Selain itu, Nuklear Malaysia turut menyelaraskan dan mengurus hal ehwal nuklear di peringkat kebangsaan dan antarabangsa serta bertindak sebagai pihak berkuasa kebangsaan bagi pelaksanaan *Comprehensive Nuclear-Test-Ban Treaty (CTBT)*.

For the past five decades, Nuklear Malaysia has recorded many successes. Nuklear Malaysia has managed to preserve its identity as a pioneer in the field of nuclear science and technology, especially in the context of research and development, innovation, and the commercialisation of nuclear technology.



Sepanjang tahun 2018 Nuklear Malaysia telah menghasilkan 13 produk penyelidikan, 7 proses, 22 prosedur, 6 pangkalan data dan 5 perisian. Manakala jumlah penerbitan pula adalah sebanyak 590 penerbitan meliputi buku, bab dalam buku, tesis, jurnal, pembentangan antarabangsa dan kebangsaan, prosiding, penerbitan am serta lain-lain penerbitan dari semua bidang penyelidikan terkini dalam sains dan teknologi nuklear.

Demi meneruskan kecemerlangan, Nuklear Malaysia perlu menggiatkan mempromosi kemudahan dan kepakaran teknologi nuklear di seluruh Malaysia. Ini akan memberi impak positif dalam jaringan kerjasama antara agensi dan pihak industri bagi meningkatkan kualiti penyelidikan dan pengkomersialan pada masa akan datang.

Malaysia Nuclear Agency is not only a national research institute tasked with the promotion, development, and encouragement of the use of nuclear technology, it is also tasked with the provision and training of nuclear expertise throughout the country. Nuklear Malaysia is also responsible for managing national and international nuclear related issues pertaining to the fulfilment of the Comprehensive Nuclear-Test-Ban Treaty (CTBT).

Throughout the year 2018, Nuklear Malaysia produced 13 research products, 7 processes, 22 procedures, 6 databases, and 5 software. Nuklear Malaysia has also published 590 articles, encompassing books, book chapters, theses, journal articles, national and international conference presentations, proceedings, general publications, and other publications pertaining to the current development and advancement in nuclear science and technology.

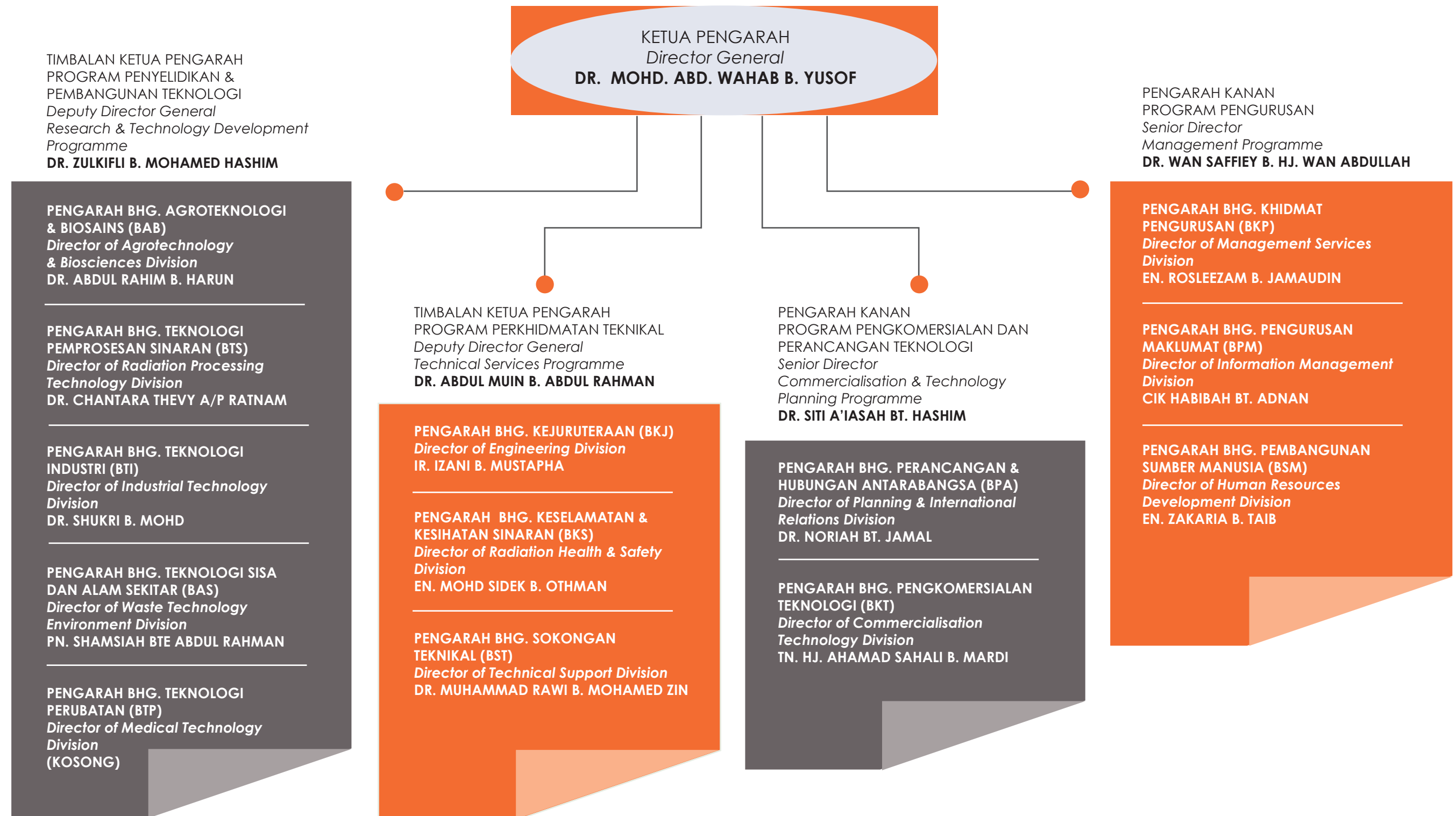
In order to retain its edge in the research, development, and commercialisation of nuclear technology, Nuklear Malaysia is heavily involved in promoting the available facilities and expertise pertaining to nuclear technology in Malaysia. This is expected to positively impact the collaborative effort between Nuklear Malaysia and its industrial partners, which would lead to improved research and commercialisation endeavours in the near future.

YBrs. Dr. Mohd. Abd. Wahab Bin Yusof
KETUA PENGARAH
AGENSI NUKLEAR MALAYSIA
DIRECTOR GENERAL
MALAYSIA NUCLEAR AGENCY



CARTA ORGANISASI

ORGANISATIONAL CHART



BARISAN PENGURUSAN

MANAGEMENT TEAM

PENGURUSAN TERTINGGI AGENSI NUKLEAR MALAYSIA
Malaysian Nuclear Agency Top Management



1 KETUA PENGARAH
Director General
DR. MOHD. ABD. WAHAB B. YUSOF

2 TIMBALAN KETUA PENGARAH
PROGRAM PENYELIDIKAN & PEMBANGUNAN
TEKNOLOGI
Deputy Director General
Research & Technology Development Programme
DR. ZULKIFLI B. MOHAMED HASHIM

3 TIMBALAN KETUA PENGARAH
PROGRAM PERKHIDMATAN TEKNIKAL
Deputy Director General
Technical Services Programme
DR. ABDUL MUIN B. ABDUL RAHMAN

4 PENGARAH KANAN
PROGRAM PENGKOMERSIALAN DAN
PERANCANGAN TEKNOLOGI
Senior Director
Commercialisation & Technology
Planning Programme
DR. SITI A'IASAH BT. HASHIM

5 PENGARAH KANAN
PROGRAM PENGURUSAN
Senior Director
Management Programme
DR. WAN SAFFIEY B. HJ. WAN ABDULLAH

BARISAN PENGURUSAN

MANAGEMENT TEAM

PROGRAM PENYELIDIKAN & PEMBANGUNAN TEKNOLOGI
Research & Technology Development Programme



1 TIMBALAN KETUA PENGARAH
PROGRAM PENYELIDIKAN & PEMBANGUNAN TEKNOLOGI
Deputy Director General
Research & Technology Development Programme
DR. ZULKIFLI B. MOHAMED HASHIM

2 PENGARAH BHG. AGROTEKNOLOGI
& BIOSAINS (BAB)
Director of Agrotechnology & Biosciences Division
DR. ABDUL RAHIM B. HARUN

3 PENGARAH BHG. TEKNOLOGI
PEMROSESAN SINARAN (BTS)
Director of Radiation Processing
Technology Division
DR. CHANTARA THEVY A/P RATNAM

4 PENGARAH BHG. TEKNOLOGI INDUSTRI (BTI)
Director of Industrial Technology Division
DR. SHUKRI B. MOHD

5 PENGARAH BHG. TEKNOLOGI SISA DAN ALAM SEKITAR (BAS)
Director of Waste Technology & Environment Division
PN. SHAMSIAH BTE ABDUL RAHMAN

6 PENGARAH BHG. TEKNOLOGI PERUBATAN (BTP)
Director of Medical Technology Division
(KOSONG)

BARISAN PENGURUSAN

MANAGEMENT TEAM

PROGRAM PERKHIDMATAN TEKNIKAL
Technical Services Programme



- 1** TIMBALAN KETUA PENGARAH
PROGRAM PERKHIDMATAN TEKNIKAL
Deputy Director General
Technical Services Programme
DR. ABDUL MUIN B. ABDUL RAHMAN
- 2** PENGARAH BHG. KEJURUTERAAN
Director of Engineering Division
IR. IZANI B. MUSTAPHA
- 3** PENGARAH BHG. KESELAMATAN &
KESIHATAN SINARAN (BKS)
Director of Radiation Safety & Health Division
EN. MOHD SIDEK B. OTHMAN

- 4** PENGARAH BHG. SOKONGAN
TEKNIKAL (BST)
Director of Technical Services Division
DR. MUHAMMAD RAWI B. MOHAMED ZIN

BARISAN PENGURUSAN

MANAGEMENT TEAM

PROGRAM PENGKOMERSIALAN DAN PERANCANGAN TEKNOLOGI
Commercialisation & Technology Planning Programme



- 1** PENGARAH KANAN
PROGRAM PENGKOMERSIALAN DAN PERANCANGAN TEKNOLOGI
Senior Director
Commercialisation & Technology Planning Programme
DR. SITI A'IASAH BT. HASHIM
- 2** PENGARAH BHG. PERANCANGAN & HUBUNGAN
ANTARABANGSA (BPA)
Director of Planning & International Relations Division
DR. NORIAH BT. JAMAL
- 3** PENGARAH BHG. PENGKOMERSIALAN TEKNOLOGI (BKT)
Director of Commercialisation of Technology Division
TN. HJ. AHAMAD SAHALI B. MARDI

BARISAN PENGURUSAN
MANAGEMENT TEAM
PROGRAM PENGURUSAN
Management Programme



2



1



3



4

1 PENGARAH KANAN
PROGRAM PENGURUSAN
Senior Director
Management Programme
DR. WAN SAFFIEY B. HJ. WAN ABDULLAH

2 PENGARAH BHG. KHIDMAT PENGURUSAN (BKP)
Director of Management Services Division
EN. ROSLEEZAM B. JAMAUDIN

3 PENGARAH BHG. PENGURUSAN
MAKLUMAT (BPM)
Director of Information Management Division
CIK HABIBAH BT. ADNAN

4 PENGARAH BHG. PEMBANGUNAN
SUMBER MANUSIA (BSM)
Director of Human Resources Development Division
EN. ZAKARIA B. TAIB

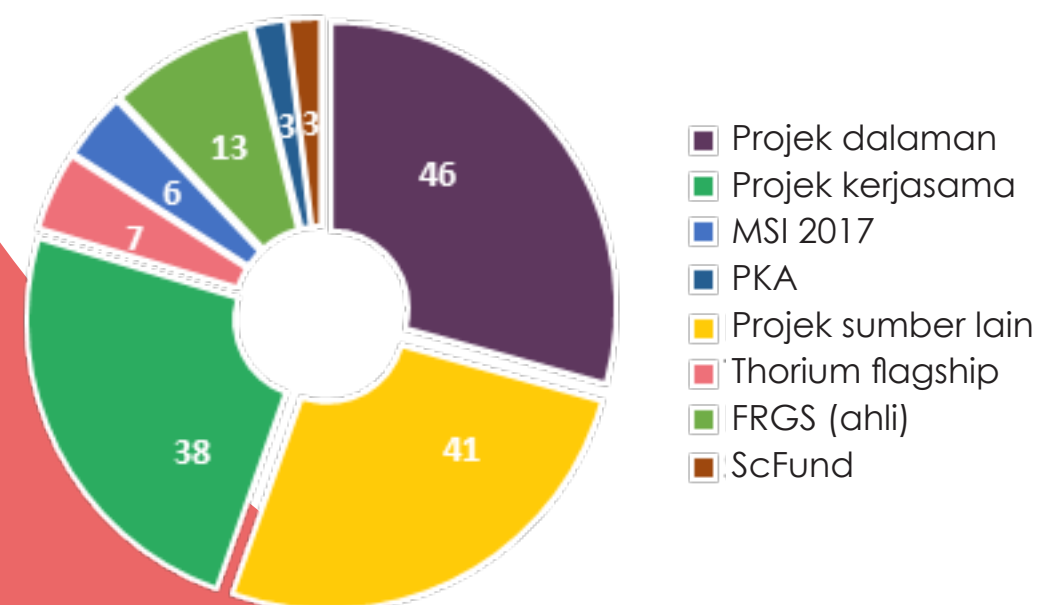
PENYELIDIKAN dan PEMBANGUNAN TEKNOLOGI

Research & Technology Development

Nuklear Malaysia terlibat secara aktif dalam teras utama R&D, dalam konteks meningkatkan keupayaan industri dan produktiviti negara. Nuklear Malaysia memberi tumpuan kepada enam teras utama - teknologi nuklear dan berkaitan, iaitu teknologi perubatan; sumber air, sisa dan alam sekitar; teknologi perindustrian; teknologi radiasi; teknologi reaktor nuklear, serta agroteknologi dan biosains. Teras utama ini membantu usaha negara menjana pendapatan bagi menyokong bidang R&D. Berikut adalah output R&D Nuklear Malaysia:

Nuklear Malaysia is actively involved in thrust of R&D in the context of enhancing the nation's industrial capabilities and productivity. Nuklear Malaysia focuses the six 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 thrusts help the nation's efforts to generate revenue as well as to support R&D endeavours. The following are Nuklear Malaysia's R&D's output story:

Projek Penyelidikan Nuklear Malaysia 2018
2018 Nuklear Malaysia's Research Project



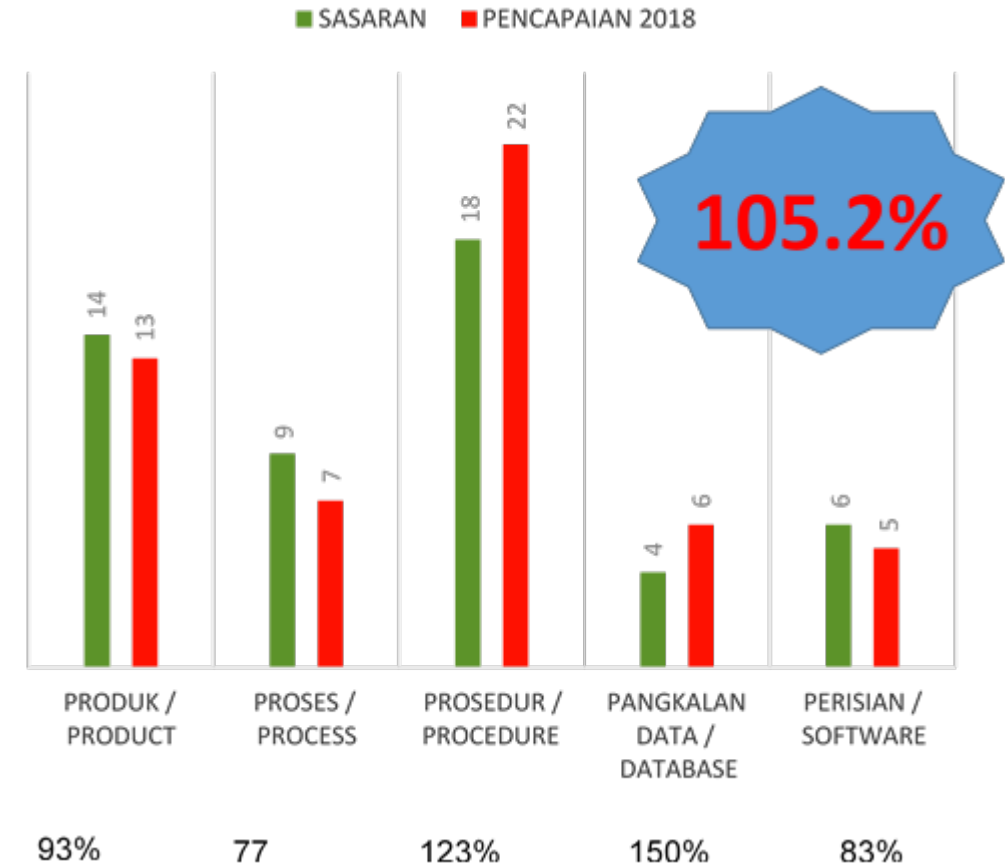
Penyelidikan dan pembangunan teknologi Nuklear Malaysia dinilai dalam konteks mengikut beberapa kategori yang dipilih; Produk penyelidikan dan hasil, sijil analisis yang dikeluarkan dari kemudahan utama dan penerbitan.

Research and technological development of Nuklear Malaysia are evaluated within the context of a few select categories; Research product and outcomes, analyses certificates issued from our main facilities, and publications.

Pencapaian P&P
R&D's Achievements

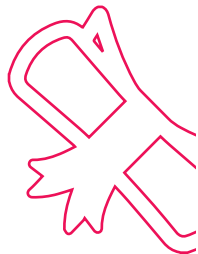


HASIL PENYELIDIKAN RESEARCH OUTPUT	JUMLAH TOTAL
1) Produk / Product	13
2) Proses / Process	7
3) Prosedur / Procedure	22
4) Pangkalan Data / Database	6
5) Perisian / Software	5



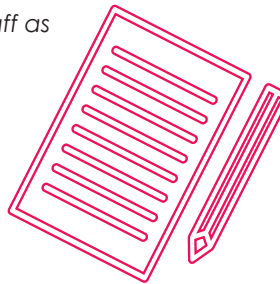
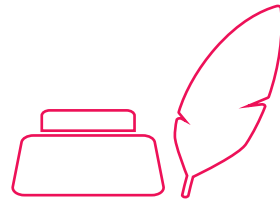
Sijil / Laporan analisis yang dikeluarkan oleh kemudahan utama
Analyses certificates / Reports issued by main facilities

SIJIL / LAPORAN	JUMLAH TOTAL	CERTIFICATE/ REPORT
Sijil Penyinaran – MINTec Sinagama	2849	Radiation Certificate-MINTec Sinagama
Sijil Penyinaran – Alurtron	255	Radiation Certificate-Alurtron
Sijil Latihan – Pusat Latihan	2350	Training Certificate-Training Centre
Sijil Analisis RVNL – Raymintex	3	RVNL Analyses Certificate-Raymintex
Sijil Tentukuran Alat Meter Tinjau	2711	Survey Meter Calibration Certificate
Sijil Pengukuran Keradioaktifan Gama	2173	Gamma Radioactivity Measurement Certificate
Sijil Ujian Kebocoran	281	Leakage Testing Certificate
JUMLAH	10,622	TOTAL



Jumlah penerbitan
Total publications

PENERBITAN	BILANGAN NUMBER	PUBLICATIONS
Buku	3	Books
Bab dalam buku	7	Chapter in books
Tesis (Sarjana dan PhD) –Oleh staf Nuklear Malaysia	3	Thesis – By Nuklear Malaysia's staff
Tesis (Sarjana dan PhD) – Staf Nuklear Malaysia sebagai penyelia	112	Thesis – Nuklear Malaysia's staff as supervisors
Jurnal antarabangsa	84	International journals
Jurnal kebangsaan	10	National presentations
Pembentangan antarabangsa	50	International presentations
Pembentangan kebangsaan	108	National conferences
Penerbitan am antarabangsa	6	International general publications
Penerbitan am kebangsaan / Laporan teknikal	207	National general publication / Technical reports
Jumlah penerbitan	590	Total publications



Seiring dengan aspirasi kerajaan, Nuklear Malaysia menjalankan aktiviti R&D untuk memenuhi keperluan industri. Pencapaian ini dinilai berdasarkan kejayaan pemindahan teknologi dari Nuklear Malaysia kepada rakan industri.

In line with the government's aspirations, Nuklear Malaysia conducts R&D activities to address industrial needs. The achievements are evaluated based on the success of technology transfer from Nuklear Malaysia to the industrial partners.

Pemindahan Teknologi / Kerjasama P&P Technology Transfer / R&D Cooperation

JENIS PERJANJIAN	TYPE OF AGREEMENT	NAMA PARTI NAME OF PARTY
Memorandum Persefahaman bagi Tujuan Kerjasama Penyelidikan dan Pendidikan dalam Bidang Teknologi Radar Penembusan Tanah	Memorandum of Understanding for Research Collaboration and Education Purposes in the Field of Ground Breaking Radar Technology	Universiti Malaysia Perlis
Perjanjian Kerahsiaan mengenai Kajian Pemetaan Dos (Dose Mapping) Terhadap Graf Tisu dan Lokasi Dosimeter	Confidentiality Agreement on Dose Mapping Study on Tissue Graphs and Dosimeter Locations	Universiti Sains Malaysia
Perjanjian Kerahsiaan mengenai "Gastrointestinal Transit Studies on Amphotericin B Containing Chitosan-Pectinate Nanoparticulate Formulation"	Confidentiality Agreement on the "Gastrointestinal Transit Studies on Amphotericin B Containing Chitosan-Pectinate Nanoparticulate Formulation"	The University of Nottingham in Malaysia Sdn Bhd
Memorandum Persefahaman Bagi Tujuan Kerjasama dan Usahasama dalam Melaksanakan dan Menyokong Program / Bidang Teknologi Nuklear	Memorandum of Understanding for the Cooperation and Joint Venture Purposes in Implementing and Supporting Nuclear Technology Programme / Field	Universiti Tun Hussein Onn Malaysia
Perjanjian Kerahsiaan mengenai Kolaborasi Penyelidikan dan Pembangunan Teknologi Pemeriksaan dalam Talian atau In-line Inspection Research and Development Collaboration	Confidentiality Agreement on the Collaboration Research and Development of Online Inspection Technology or In-line Inspection Research and Development Collaboration	Advance Borneo Engineering Sdn Bhd
Perjanjian Kerahsiaan Mengenai Effective Field Inspection Tool to Detect and Assess Corrosion Under Insulation (CUI) for Piping Systems and Components	Confidential Agreement on the Effective Field Inspection Tool to Detect and Assess Corrosion Under Insulation (CUI) for Piping Systems and Components	TEC Technique Sdn Bhd
Perjanjian Kerahsiaan Mengenai Penggunaan Biofertilizer untuk Test Plot Jagung	Confidential Agreement on the Biofertilizers Usage for Maize Test Plots	BB Group International Sdn Bhd

Sebagai sebuah institut penyelidikan, kemahiran kreativiti dan inovasi adalah elemen yang diharapkan dari setiap pekerja. Pada tahun 2018, penyelidik Nuklear Malaysia dianugerahkan pelbagai penghargaan di peringkat kebangsaan dan antarabangsa. Sebahagian daripada anugerah tersebut adalah seperti di bawah:

As a research institute, the creativity and innovation skills are elements that are expected from every employee. In 2018, Nuklear Malaysia's researchers are awarded many accolades at national and international levels. Some of these awards are detailed below:

Pencapaian Inovasi Innovation Achievements

Bil./ No.	Program / Programme	Pingat/Award Emas / Gold :
1	Malaysian Technology Expo 2018 (MTE2018)	BioNIK-P –Gamma Irradiated Multifunctional Liquid Biofertilizer Perak / Silver : - AREFCERT : Radiofrequency Radiation Safety Level System - Prevulcanized of Natural Rubber Latex via Hybrid Radiation and Peroxidation Vulcanizations Gangsa/Bronze: Radioactive Particle Tracking System - Advance Non Invasive Radiation Based Techniques for 3D Hydrodynamic Visualization in Opaque Multiphase Flow System
2	Ekspo Inovasi Islam 2018 (i-Inova18)	Emas/Gold: - BioNIK-P –Gamma Irradiated Multifunctional Liquid Biofertilizer - Prevulcanized of Natural Rubber Latex via Hybrid Radiation and Peroxidation Vulcanizations - New Edge of Volvariella Seedling Revolution Perak/Silver: AREFCERT : Radiofrequency Radiation Safety Level System Gangsa/Bronze : Sistem Pengesanan Sinaran Pintar (SARD)
3	InTEX 2018 Innovation Technology Expo	Emas/Gold: Smart Winder : Automatic Gamma Winding System Perak/Silver : - RT Safe Mechanical Safety Kit for Industrial Radiography - AREFCERT: Radiofrequency (RF) Radiation Safety Level System
4	Hari Inovasi Nuklear Malaysia	Emas/Gold: - Smart Radiation Shielding Materials (Mullite-Barite Ceramics (MBC)) Derived from Malaysian Kaolin - Flex-Si: An innovative Scanner for Industrial Pipe Inspection - Innovative Methods for Rapid Production of Gallium-68 - Radiopharmaceuticals for Cancer Imaging - TRINAF: Gardening Aids from Mineral (Xenotime) Digestion Process Perak/Silver: - Bacterial Bio-Plastic from Pome - Development of Probabilistic Safety Assessment for Plant Safety and Reliability - Low-COST Core Flood Rif: Radiotracer Technology (LCCF-RT) - TRIMON – Integration of TRIGA-MONTE CARLO Code using Homogenized Neutron Cross Section - AREFCERT 2.0 Gangsa/Bronze: - Response Simulator - I-PFRx (Intelligent Pipe Failure ate Assessment Method for Water-Cooled Reactor) - EziCapener: An Easy and Convenient Tool to Open Tubes - Green Catalyst for Biodiesel Production - Mini Portable Peltier Refrigerator - Imprinted Polymer via Irradiation Technique for Selective Separation of Thorium from Aqueous Medium - ECPunch- Educational Course PunchCard System Agensi Nuklear Malaysia - SiMPaKN: Pembangunan Sistem Maklumat Pakar Nuklear Malaysia
5	Anugerah Inovasi Peringkat Antarabangsa	4 penyertaan / 4 participations
6	Anugerah Inovasi Peringkat Kebangsaan	3 penyertaan / 3 participations

International Invention Innovation and
Technology Exhibition 2018
(InTEX2018)



PEMINDAHAN dan
PENGKOMERSIALAN TEKNOLOGI
Technology Transfer and Commercialisation

Khidmat Profesional

Jumlah Pendapatan daripada Khidmat Profesional

Nuklear Malaysia menjana RM12.05 juta melalui penyediaan perkhidmatan profesional pada tahun 2018. Perkhidmatan teknikal merupakan penyumbang tertinggi, diikuti dengan bekalan produk dan perkhidmatan latihan. Sebilangan kecil hasil diperoleh daripada kontrak / pemberian yang berkaitan dengan penyelidikan dan perundingan, serta dividen-dividen daripada pelaburan.

Professional Services

Revenue from Professional Services

Nuklear Malaysia generated RM12.05 million via the provision of professional services in the year of 2018. Technical services represent the highest contribution, followed by product supply and training services. A small portion of the revenue was derived from a contract/grant pertaining to research and consulting, as well as dividends from investments.

Sumber Pendapatan Income Sources	Jumlah Pendapatan (RM/Juta) Total Revenue (RM/Million)
Bekalan Produk Product supply	3.11
Latihan Training	2.35
Perkhidmatan Teknikal Technical Services	6.21
Kontrak/Geran penyelidikan/ Runding cara Contract/Research Grants/Consultancies	0.27
Dividen Daripada Pelaburan Investment Dividends	0.12
Jumlah/Total	12.06

1 JENIS-JENIS KHIDMAT PROFESIONAL Types of Professional Services



Bekalan Produk Product Supply

- ❖ Makmal Standard Dosimetri Sekunder (SSDL)
Secondary Standards Dosimetry Laboratories
- ❖ RAYMINTEX - Loji Prapemvulkanan Lateks Getah Asli Menggunakan Sinaran Gama (RVNRL)
Prevulcanised Natural Rubber Latex (RVNRL) Facility using Gamma Ray
- ❖ Bekalan Radioisotop
Supply of Radioisotopes



Pendidikan dan Latihan Training and Education

- ❖ PUSAT LATIHAN - Menganjurkan latihan pelbagai sektor, antarabangsa, Program Bersekutu/pakatan bestari
TRAINING CENTERS - Executing training programmes for multiple national and international sectors
- ❖ PGEC - Post-Graduate Education Course



Perkhidmatan Teknikal Technical Services

- | | |
|---|--|
| ❖ Fizik Perubatan (KFP)
<i>Medical Physics</i> | ❖ SINAGAMA |
| ❖ Kimia Analisa (ACA)
<i>Chemical Analyses</i> | ❖ ALURTRON |
| ❖ Analisa Radiokimia & Alam Sekitar (RAS)
<i>Radiochemistry and Environmental Analyses</i> | ❖ Latihan Fellow Luar Negara (IAEA/BPA)
<i>Training for International Fellows</i> |
| ❖ Makmal Teknologi Sinaran (MTS)
<i>Radiation Technology Laboratory</i> | ❖ Teknologi Pertanian / STERIFEED (TAB)
<i>Agricultural Technology</i> |
| ❖ Kumpulan Analisa Bahan (MTEG)
<i>Materials Technology Group</i> | ❖ Sinaran Tak Mengion (NIR)
<i>Non-Ionising Radiation</i> |
| ❖ Ujian Tanpa Musnah (NDT)
<i>Non-Destructive Testing</i> | ❖ Teknologi Pentaksiran Loji
<i>Plant Assessment Technology</i> |
| ❖ Pengurusan Sisa Radioaktif (WASTEC)
<i>Radioactive Waste Management</i> | ❖ Environmental Tracer Application Group (e-TAG) |
| ❖ BIOTEST/BIODOS | ❖ Kumpulan Fizik Kesihatan (KFK)
<i>Health Physics Group</i> |
| | ❖ Pusat Teknologi Reaktor (PTR)
<i>Reactor Technology Centre</i> |

2 KHIDMAT LATIHAN Training Service

- ❖ Nuklear Malaysia menawarkan khidmat latihan untuk pekerja sinaran
Nuklear Malaysia offers training services for radiation workers
- ❖ Jumlah produk latihan
Total training products - 38
- ❖ Jumlah kursus
Total courses - 130
- ❖ Jumlah peserta
Total participants - 23503
- ❖ Jumlah pendapatan
Total income - RM2.35 juta

3 PRODUK/PERKHIDMATAN PASARAN ANTARABANGSA Product / Services Overseas Markets

- ❖ HippoScan
- ❖ AREFCERT - Radiofrekuensi CRT
- ❖ Calibration Radiation Measuring Instrument
- ❖ (Survey Meter/ Ionization Chamber Calibration)
- ❖ TLD Personal Dosimetry
- ❖ OSL Velosi Personal Dosimetry
- ❖ Perkhidmatan Ujian Mesin X-ray
X-ray analyses services

4 PEMBANGUNAN PROGRAM TEKNO-USAHAWAN DAN INDUSTRI KECIL SEDERHANA (IKS) Development of Techno-Entrepreneur Small Medium Enterprise (SME)

- ❖ Program kesedaran dan pemasaran untuk IKS
Awareness and marketing programme for SMEs
- ❖ Jaringan kerjasama untuk pemindahan dan pengkomersialan teknologi
Collaboration network for technology transfer and commercialisation



5 PROGRAM PROMOSI DAN PEMASARAN Marketing and Promotion Programme

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

Nuklear Malaysia remains active in national and international exhibitions organised by SME Corp Malaysia, MESTECC, and other institutions. The exhibitions participated by Nuklear Malaysia are detailed below:

Bengkel Pendidikan Radiasi untuk Pelajar Sekolah Menengah 2018

Seminar Aplikasi Teknologi Nuklear dalam Forensik

Seminar Industri Cendawan 2018

Bengkel Radiasi Guru Sains Sempena Minggu Sains Negara Peringkat Negeri Sembilan

Seminar Keselamatan Makanan 2018

Bengkel Pengurusan Pengetahuan (KM) 2018, Knowledge Book 2.0

Bengkel Sains Nuklear (Radiasi) untuk Guru Sains Sekolah Menengah Bil 1/2019

Program Hari Pengurusan Pengetahuan (KM) 2018

Knowledge Sharing by Expert : Application of Accelerator: Cyclotron

Bengkel Sains Nuklear (Radiasi) untuk Guru Sains Sekolah Menengah Bil 2/2018

Seminar R&D 2018

Aktiviti Sudut Sains Sempena Hari Inovasi pada *Technology Preview & Showcase* Nuklear Malaysia 2018

Pameran di Majlis Penyerahan Projek MOSTI *Social Innovation* (MSI) Nuklear Malaysia

Pameran Sempena Seminar Industri Cendawan 2018

Pameran Sempena Minggu Sains Negara Peringkat Negeri Sembilan 2018

Pameran Sempena Hari Kemerdekaan Antarabangsa 2018

Pameran Keselamatan NIR dan Pengenalan Nuklear Malaysia sempena Karnival Ko-Kurikulum SMK Kuala Besut

Pameran Sempena Program Satelit oleh Projek MSI 17111 Nuclear BFF

Pameran Hari Kokurikulum SMK Toh Indera Wangsa Ahmad

Pameran Produk R&D dan Khidmat, Hari Inovasi Sempena *Technology Preview & Showcase* Nuklear Malaysia 2018

PERKHIDMATAN TEKNIKAL dan SOKONGAN

Technical Services & Support

Sokongan teknikal mewakili elemen penting bagi menyokong kelancaran operasi P&P Nuklear Malaysia. Sistem sokongan teknikal seperti kemudahan makmal, utiliti, infrastruktur ICT dan komunikasi adalah sebagai pemangkin untuk membantu organisasi mencapai matlamat tersebut. Pada tahun 2018, penyelidik dan kakitangan teknikal Nuklear Malaysia telah berjaya membangunkan kemudahan *Mobile Hot Cell*.

Mobile Hot Cell adalah kemudahan berperisai bertutup yang dilengkapi dengan peralatan pengendalian jarak jauh yang mampu menjalankan kerja pemeriksaan dan rawatan ke atas punca radioaktif terpakai beraktiviti tinggi. Kemudahan ini boleh beroperasi dan diangkut, dipasang serta dilarikan di lokasi yang diperlukan. Kemudahan ini disifatkan sebagai kemudahan berdiri sendiri. Sehingga kini hanya terdapat tiga unit sahaja kemudahan ini iaitu di Afrika Selatan, China dan Malaysia.

Kemudahan *Mobile Hot Cell* ini mampu mengeluarkan punca radioaktif beraktiviti tinggi (kategori 1 dan 2) daripada mesin teleterapi dan penyinar gama yang bersamaan dengan 2000 Curie Co-60. Hanya punca radioaktif terkedap yang boleh dikendalikan dengan kemudahan ini. Pada masa sekarang, terdapat dua punca radioaktif daripada dua mesin teleterapi telah berjaya dikeluarkan dan disimpan di dalam bekas simpanan jangka panjang.

Technical support represents a crucial element that supports research and development activities in Nuklear Malaysia. Technical support systems, such as laboratories, utilities, ICT and communication infrastructure assist the organisation towards meeting the aforementioned goals. In 2018, researchers and technical personnel has successfully developed a Mobile Hot Cell facility.

Mobile Hot Cell is a shielded enclosure facility, equipped with remote control handling where the high activity Disused Radioactive Sources (DSRS) can be safely examined and conditioned. The term mobile for Mobile Hot Cell refers to the capability of the facility to be transported, assembled, and dismantled at any locations needed. This facility is regarded as an independent facility. At this moment, there are only three units available in the world, located in South Africa, China, and Malaysia.

The Mobile Hot Cell facility is capable of retrieving high activity sources (category 1 and 2) from the teletherapy head and gamma irradiator equivalent to 2000 Curie Co-60. Only sealed sources can be handled by the facility. Recently, two sources from old teletherapy machines have been retrieved and stored in the Long Term Storage Shield.

Projek Mobile Hot Cell adalah projek kolaborasi antara kerajaan Malaysia dengan IAEA. Projek ini dibiayai dibawah Rancangan Malaysia ke-10/11 dan IAEA menanggung latihan untuk 14 operator Nuklear Malaysia. Ketika ini, kemudahan sedang menunggu kelulusan lesen daripada LPTA selepas berjaya melepasi Kajian Setara kedua tahun 2018. bawah Rancangan Malaysia ke 10/11 dengan bantuan IAEA untuk latihan dan Panel yang dilantik oleh IAEA terdiri daripada pakar dari Amerika Syarikat, Kanada, Brazil, China, Perancis, Afrika Selatan dan Jerman.

The Mobile Hot Cell project is a collaboration project between Malaysia Government and International Atomic Energy Agency (IAEA). The project was funded under the 10th/11th Malaysia Plan, and the training for 14 operators was provided by the IAEA. The facility is currently waiting for operational license approval from Atomic Energy Licensing Board (AELB) after a successful second International Peer Review in 2018. The panels of the review, assigned by the IAEA, were experts from the USA, Canada, Brazil, China, France, South Africa, and Germany.

Kemudahan Mobile Hot Cell

Mobile Hot Cell facilities



TEKNOLOGI REAKTOR

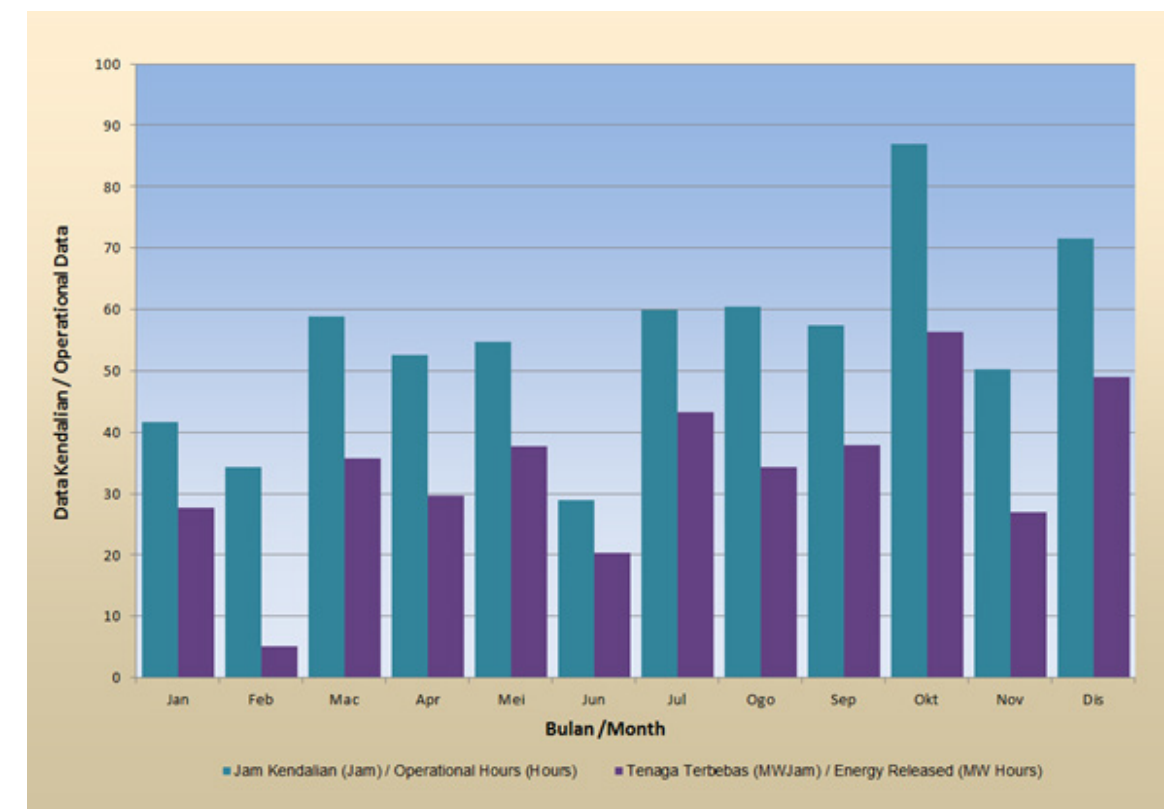
Reactor Technology

Pada tahun 2018, pelbagai aktiviti telah dijalankan di Reaktor TRIGA PUSPATI (RTP), seperti aktiviti penyelidikan dan pembangunan, penyinaran sampel, latihan modal insan, penyenggaraan kemudahan dan perlesenan.

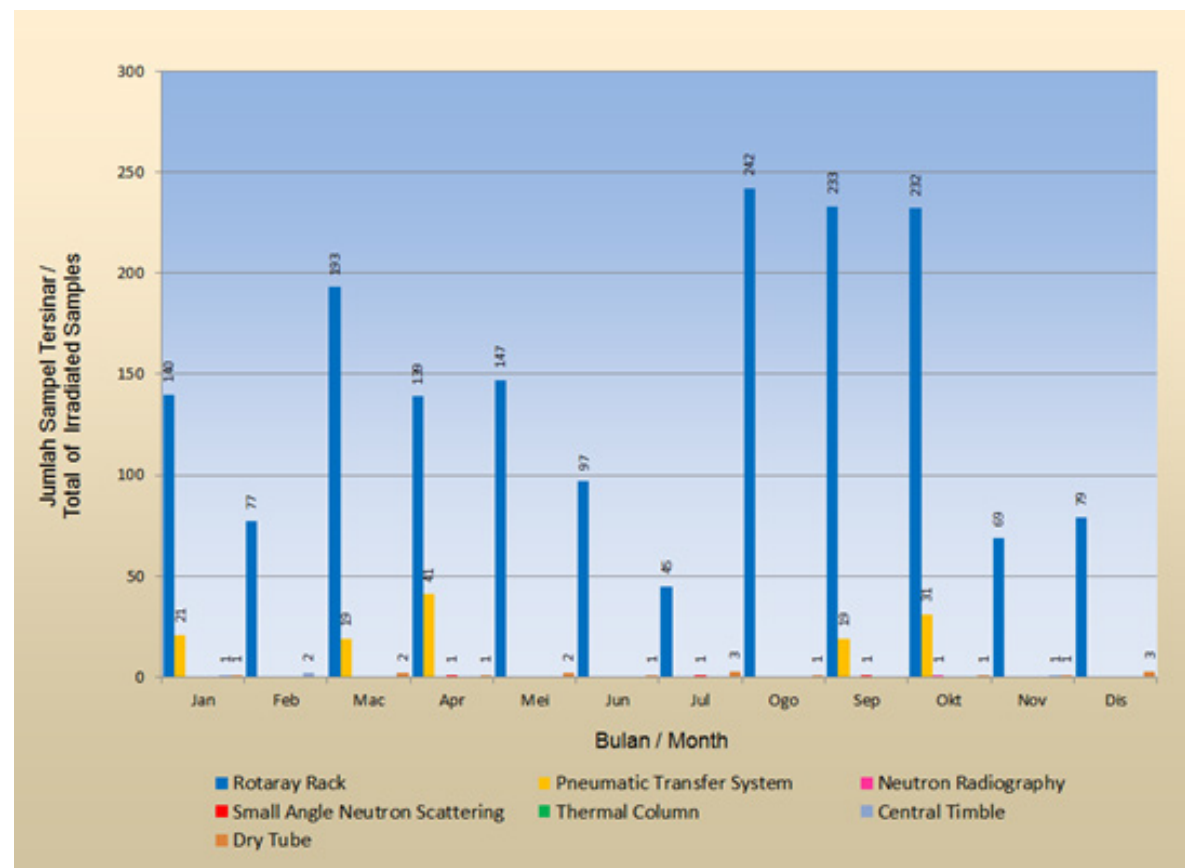
In 2018, various activities took place at the RTP (Reaktor TRIGA PUSPATI), such as research and development, samples irradiation, human resource development, facility maintenance, and licensing activities.

RTP telah dikendalikan dengan selamat dengan jumlah terkumpul sebanyak 657 jam dan pembebasan tenaga sebanyak 404 MW/jam pada tahun 2018. Sebanyak 157 permohonan penyinaran diterima dengan jumlah keseluruhan 1848 sampel telah disinarkan.

The RTP has been operating safely for a cumulative operating time of 657 hours, releasing 404 MW/hours of energy in 2018. A total of 157 irradiation applications were received, with a total of 1848 samples irradiated.



Data kendalian dan tenaga terbebas dari Januari hingga Disember 2018
RTP operation and energy released data from January to December 2018



Jumlah sampel tersinar di RTP dari Januari hingga Disember 2018
Total irradiated samples at RTP from January to December 2018



- 1 Audit IAEA bagi kawal selia bahan nuklear RTP
IAEA audit on RTP nuclear material monitoring



- 2 Lawatan saintifik oleh delegasi negara Congo ke RTP
Scientific visit from Congo delegation to RTP



- 3 Proses pengeluaran radioisotop samarium daripada kemudahan penyinaran tiub kering
Removal process of samarium radioisotope from dry tube irradiation facility



- 4 Latihan amali dalam kalangan pelatih pengendali reaktor
Hands-on training among reactor operator trainees



- 5 Pemeriksaan integriti bahan api nuklear semasa penyenggaraan tahunan RTP
Inspection of nuclear fuel element integrity during RTP annual maintenance



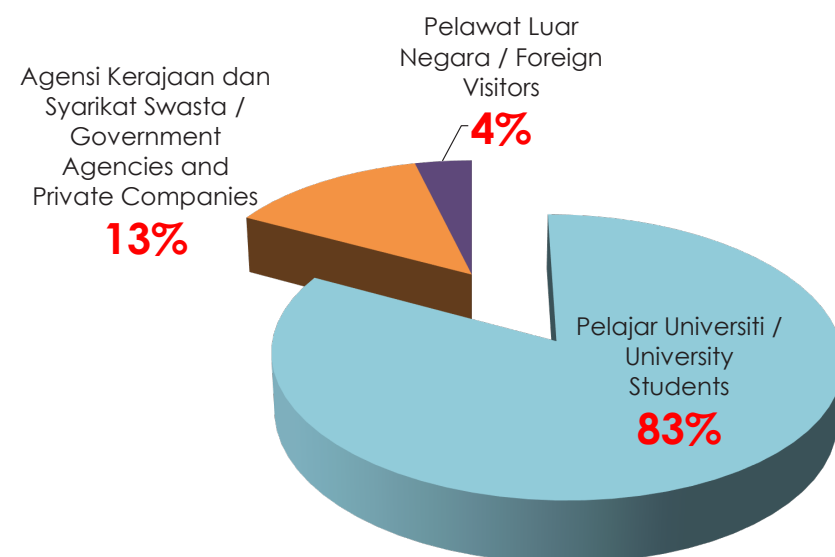
6

Pemasangan peralatan bagi menentukan status penyusutan bahan api nuklear melalui teknik radiografi
Installation of equipment to determine nuclear fuel burnup status through radiography technique



7

Penentuan parameter kimia air bagi bahan penyejuk RTP
Determination of water chemistry parameter for RTP coolant



RTP merupakan antara kemudahan utama di Nuklear Malaysia yang kerap menerima kehadiran pelawat. Sejumlah 1,568 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 2018.

RTP is one of the main facilities in Nuklear Malaysia which regularly receives visitors. A total of 1,568 visitors from various background such as government agencies, private companies, university students, course participants and foreign visitors visited this facility in 2018.

Pelawat RTP RTP VISITORS



PROGRAM LATIHAN DAN AMALI REAKTOR

RTP sentiasa komited memainkan peranannya sebagai sebuah pusat latihan dan pendidikan khusus teknologi reaktor. Berikut adalah senarai program latihan dan amali yang telah dilaksanakan pada tahun 2018.

REACTOR TRAINING AND PRACTICAL PROGRAMME

RTP is always committed in fulfilling its role as a training and educational centre, specialise in nuclear technology. The following is the training and hands-on courses carried out in 2018.



- 1** Bengkel Kejuruteraan Nuklear dan Aplikasi Reaktor bagi Pelajar Universiti Sains dan Teknologi Sudan (SUST)
Workshop on Nuclear Engineering and Reactor Application from Sudan University of Science and Technology (SUST)



- 2** Sesi Amali berkaitan Senarai Ujian di Awal Kendalian dan Suai Kenal dengan Sistem, Struktur dan Komponen RTP bagi Pelajar UNITEN – Siri 1
Practical Session on Reactor Start-up Checklist and Familiarisation with RTP Systems, Structures and Components (SSCs) for UNITEN – Series 1



- 5** Pengenalan Reaktor Penyelidikan Nuklear di Malaysia kepada Pelajar Sekolah Menengah Analisis Kimia Padang, Sumatera, Indonesia.
Introduction to Malaysian Nuclear Research Reactor for Sekolah Menengah Analisis Kimia Padang, Sumatera, Indonesia.



- 6** Sesi Amali berkaitan Senarai Ujian di Awal Kendalian dan Suai Kenal dengan Sistem, Struktur dan Komponen RTP bagi Pelajar UNITEN – Siri 2
Practical Session on Reactor Start-up Checklist and Familiarisation with RTP Systems, Structures, and Components (SSCs) for UNITEN – Series 2

- 3** Sesi Amali Pelajar Sarjana Muda Sains Kejuruteraan Nuklear, Universiti Teknologi Malaysia (UTM)
Practical Session for Bachelor of Science in Nuclear Engineering Students, Universiti Teknologi Malaysia (UTM)

- 4** Pengenalan kepada Reaktor Penyelidikan dan Penggunaannya kepada Pelajar Sarjana Keselamatan Sinaran dan Nuklear, Universiti Kebangsaan Malaysia (UKM)
Introduction to Research Reactor and Its' Utilisation for Radiation and Nuclear Safety Master Course Students, Universiti Kebangsaan Malaysia (UKM)

- 7** Pengenalan Reaktor Penyelidikan kepada Pelajar Program Sains Nuklear, Universiti Kebangsaan Malaysia (UKM)
Introduction to Research Reactor for Nuclear Science Program Students, Universiti Kebangsaan Malaysia (UKM)

- 8** Bengkel Reaktor Nuklear berkaitan Fizik Reaktor dan Penggunaan Neutron kepada Peserta daripada Rantau Asia Pasifik (RSEAP2018)
Research Reactor School on Reactor Physics and Neutron Applications for the Asia Pacific Region (RSEAP2018)

KESELAMATAN dan KESIHATAN PEKERJAAN

Occupational Safety & Health

Nuklear Malaysia menyediakan khidmat teknikal berkaitan keselamatan sinaran bagi memastikan keselamatan dan kesihatan pekerja mahupun alam sekitar sentiasa berada pada tahap yang optimum. Selain itu, jalinan kerjasama turut diadakan dengan Lembaga Perlesenan Tenaga Atom (LPTA) dan Jabatan Keselamatan dan Kesihatan Pekerjaan (JKKP) di bawah khidmat nasihat teknikal serta pemantauan IAEA bagi memperkasa bidang keselamatan, sekuriti dan kawal selia (3S) di Malaysia.

Nuklear Malaysia amat menitikberatkan kesiapsiagaan seluruh warga kerjanya dalam menghadapi situasi kecemasan. Pada tahun 2018, latihan amal kecemasan telah diadakan di 39 buah bangunan Nuklear Malaysia. Latihan radiologi dan sekuriti reaktor juga telah berjaya diadakan pada tahun 2018.

Nuklear Malaysia provides technical services related to radiation safety to ensure that the safety and health of workers as well as the environment remains optimal. Besides that, collaborations with Atomic Energy Licensing Board (AELB) and the Department of Occupational Safety and Health (DOSH) under technical consultant services and IAEA monitoring to enhance safety, security and safeguard (3S) in Malaysia.

Nuklear Malaysia emphasise its personnel's awareness and adaptability in emergency situations. In 2018, emergency response simulation was carried out for 39 buildings located in Nuklear Malaysia. Radiological and reactor security trainings were also conducted in 2018.



Latih amal kecemasan
Emergency response simulation

KLUSTER CLUSTER	AKTIVITI ACTIVITY	PENCAPAIAN ACHIEVEMENT
Khidmat Teknikal Technical Service	1. KFP i) Tentukuran QC/QC calibration ii) Lead Equivalent thickness iii) Dose calibrator	1. KFP i) 101 alat ii) 67 bilik iii) 41 unit
	2. SSDL i) Tentukuran meter tinjau/Calibration Survey Meter ii) High Dose - CECE iii) OSL iv) TLD	2. SSDL i) 3,505 ii) 10,533 iii) 162,422 iv) 14,853
	Tentukuran peralatan ujian kawalan mutu radiologi diagnostik Calibration of test equipment used quality control diagnostic radiology	342
	Ujian kawalan mutu radas penyinaran sinar-X Quality control test for X-ray irradiating apparatus	101
	Ujian ketebalan kesetaraan plumbum bilik penyinaran Lead equivalent thickness testing for irradiation room	67
	Tentukuran penentukur dos Calibration of dose calibrator	41
	Tentukuran meter tinjau Calibration of survey meter	3505
	Pembekalan OSLD Supply of OSLD	162,422
	Pembekalan TLD Supply of TLD	14,853
	Pembekalan dosimeter aras tinggi 'ceric-cerous' Supply of ceric-cerous high dose dosimeters	10,533
	Ujian kebocoran punca terkedap Leak testing services for sealed source	1016
	Penilaian Aras Sinaran Frekuensi Radio (RF) yang dihasilkan oleh Struktur Pemancar Telekomunikasi Radiofrequency (RF) Radiation Level Assessment Emitted by Telecommunication Structure System	50

HUBUNGAN dan KERJASAMA ANTARABANGSA

International Relations and Cooperation



Nuklear Malaysia telah membangunkan kerangka kerjasama yang kukuh di peringkat serantau dan antarabangsa dalam pelbagai bidang penyelidikan. Kerjasama dua hala ini bertujuan untuk menyokong perkembangan sains dan teknologi untuk kegunaan damai di Malaysia. Kerjasama serantau dan antarabangsa diperkukuh dalam pelbagai bidang penyelidikan. Nuklear Malaysia komited untuk melaksanakan misi dan visi MESTECC untuk menyokong pembangunan sains dan teknologi di Malaysia.

Nuklear Malaysia has established a strong framework for 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. Regional and international cooperation are being strengthened in various research fields. Nuklear Malaysia is committed towards implementing MESTECC's mission and vision of supporting the development of science and technology in Malaysia.

**MISI
PAKAR**
Expert Mission

**MESYUARAT
TEKNIKAL**
Technical
Meetings

**PROJEK IAEA
KEBANGSAAN
DAN
ANTARABANGSA**
International and
National
IAEA Projects

**LAWATAN
SAINTIFIK**
Scientific Visits

**PROGRAM
FELLOWSHIP**
Fellowship
Programmes

**SEMINAR/
BENGKEL/
KURSUS**
Seminars/
Workshops/
Courses

**PENYERTAAN
DAN
PENGANJURAN
PERSIDANGAN**
Participation and
Hosting of
Conferences

AKTIVITI ACTIVITIES

JANUARY 2018

Mentor kepada NLO Office of Brunei bagi Program Kerjasama Teknikal IAEA

IAEA/Mentoring NLO office of Brunei for IAEA Technical Collaborative Development Program

18TH JANUARY 2018

Lesen VSAT NDC dan RN 42 berjaya diperbaharui

Successfully renewed VSAT NDC and RN42 licenses

JANUARY 2018

Tiga Input Teknikal kepada 3 Resolusi Majlis Keselamatan UN telah disediakan iaitu Resolusi 2397 (2017) pada Januari 2018

Three technical inputs to 3 UN security council resolution via Resolution 2397 (2017) on January 2018

27TH - 30TH MAR 2018 BUSAN, KOREA

Penyertaan Malaysia ke Mesyuarat Perwakilan Kebangsaan RCA
Malaysia's participation in the RCA regional meeting

MAC 2018

Resolusi 1977 (2011) & 2325 (2016)
Resolution 1977 (2011) and 2325 (2016)

17TH - 20TH APRIL 2018 GENEVA, SWITZERLAND

Preparatory Committee for the 2020 Nuclear Non-Proliferation Treaty Review Conference

6TH - 10TH MAY 2018

ALGIER, ALGERIA

Participate in the NPE 2017 and Presentation at NDC Workshop

28TH MAY 2018

Kontrak Nuklear Malaysia-ENVA Sa diperbaharui
Renewed the contract between Nuklear Malaysia and ENVA Sa

**16TH- 20TH JULY 2018,
AGENSI NUKLEAR MALAYSIA**
National e- Learning Training Course on Access and Application on IMS Data and Products

**11TH-14TH NOVEMBER 2018,
KUALA LUMPUR**
Co-chair 18th Asia-Oceania Congress of Medical Physics & 16th South-East Asia Congress of Medical Physics

**7TH NOVEMBER 2018
AGENSI NUKLEAR MALAYSIA**
Awareness CTBT Seminar and Meeting 2018

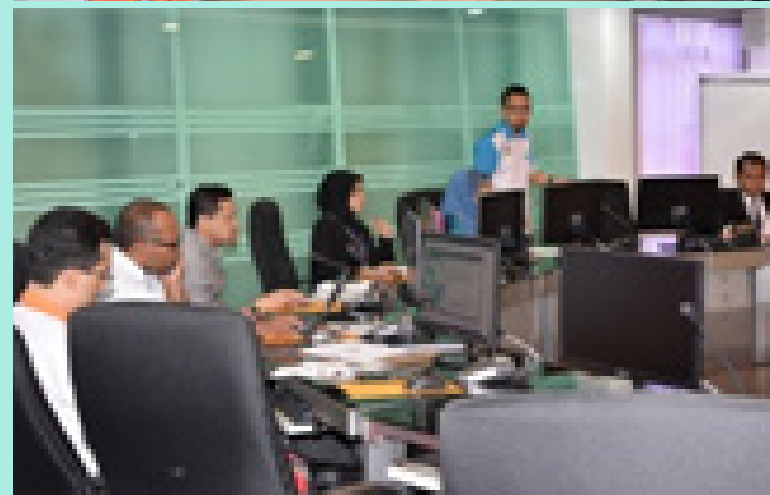
28TH - 30TH NOVEMBER 2018 VIENNA, AUSTRIA

Penyertaan delegasi Malaysia ke IAEA Ministerial Conference on Nuclear Science and Technology : Addressing Current and Emerging Development Challenge

The participation of Malaysia's delegation to the IAEA Ministerial Conference on Nuclear Science and Technology : Addressing Current and Emerging Development Challenge



3rd Awareness Seminar on CTBT, 7th November 2018



3rd National E-Learning Training Course on Access and Application of IMS Data and IDC Products, 16th July 2018

MERAKYATKAN TEKNOLOGI NUKLEAR

Humanising Nuclear Technology

Usaha merakyatkan teknologi nuklear terus dipergiat. Menerusi inisiatif MOSTI Social Innovation (MSI), Nuklear Malaysia yakin usaha ini memberikan pulangan serta manfaat kepada masyarakat. Usaha ini terbukti memberi impak sosioekonomi berdasarkan kepakaran dan pengalaman pegawai penyelidik serta penglibatan masyarakat setempat.

Efforts to humanise nuclear technology are continuously intensified. Under the MOSTI Social Innovations Initiative (MSI), Nuklear Malaysia is confident that this endeavour will benefit the community. This effort resulted in positive socioeconomic impacts due to the expertise and experience of research officers and the involvement of the local community.



Majlis Perasmian dan Penyerahan Hab Pemprosesan dan Pengembangan Cendawan (HPPC) 19 November 2018 (Kg Tempinis, Besut, Terengganu)
Officiation and Handing over of the Processing and Expansion of Mushroom Facility (HPPC), 19th November 2018 (Kg. Tempinis, Besut, Terengganu)



Nuclear BFF- Best Friend Forever (SMK Bandar Tasik Selatan) 29th June 2018



Bengkel Sains Nuklear (Radiasi) 03 Oktober 2018 SMK Presint 11 (3) Putrajaya
Nuclear Science (Radiation) Workshop, 3rd October 2018, SMK Precinct 11 (3), Putrajaya

Projek Komuniti – MSI

Projek P&P Nuklear Malaysia adalah luas dan ada di antaranya boleh digunapakai oleh komuniti untuk mengukuhkan status ekonomi. Ini telah dicapai pada tahun 2018 melalui MSI

Community Project – MSI

The Nuklear R&D projects are very broad and some can be utilised by the community to strengthened then socioeconomic status. These was achieved in 2018 through MSI.

Projek MSI MSI Project



Pakej Pengeluaran Teh Volvariella Untuk Pembentukan Usahawan Industri Kecil Sederhana (IKS) Luar Bandar
Output Package 'Volvariella Tea' for The Formation of Small and Medium Enterprises (SME)

KG. REMBANG PANAS, KUALA PILAH, NEGERI SEMBILAN



Nuclear BFF- Program Outreach Bersama OKU
Nuclear BFF Outreach Programme with the Disabled

NEGERI SEMBILAN, SELANGOR, KUALA LUMPUR DAN PUTRAJAYA



Teknologi Pengeringan Cendawan Untuk Industri Kecil Sederhana (IKS) Bagi Produk Hiliran
Mushroom Drying Technology for Small and Medium Enterprises (SME)

KAMPUNG TEMPINIS, JERTEH, TERENGGANU



Peningkatan Pendapatan Komuniti Petani/ Penternak Melalui Teknologi Silaj dan Oligokitosan
Increasing Income of Farmers and Breeders via Oligochitosan Technology

KAMPUNG PERING, KUBANG PASU, KEDAH



Membina Keupayaan Pembuatan Komponen Jeti Polimer Biokomposit Bagi Kegunaan Sektor Sosio-Ekonomi Perikanan dan Eko-Pelancongan
Skills Development of Component Manufacturing of Biocomposit Polymer Jetty for Fisheries and Eco-tourism Applications

KG. BUGAYA DARAT/ TANJUNG KAPUR, SEMPORNA, SABAH



Ternakan Ikan Patin Dalam Tangki Modular Terkawal
Rearing Silver Catfish in Modular Tanks

KG. PERUANG BENTA, KUALA LIPIS, PAHANG

PROGRAM PENGURUSAN

Management Programme

Kecemerlangan Program Pengurusan direalisasikan pada tahun 2018, sejajar dengan misi, visi, dan objektif Nuklear Malaysia. Program promosi seluruh negara bertujuan memastikan pembangunan teknologi nuklear yang berterusan. Sepanjang tahun 2018, pelbagai aktiviti telah dijalankan, di antaranya program kakitangan dan pekerjaan, kewangan, perolehan dan aset, penerbitan dan media, pengurusan latihan kakitangan, dan keselamatan fizikal dan komunikasi korporat.

The management programme excellence was realised in 2018, in line with Nuclear Malaysia's mission, vision, and objective. The nationwide promotion programme ensure the continues development of nuclear technology. Throughout 2018, various activities were carried out, among them were staff and employment affairs programs, finance, procurement and assets, publishing and media, staff training management, and physical security and corporate communications.

BAJET MENGURUS OPERATING BUDGET

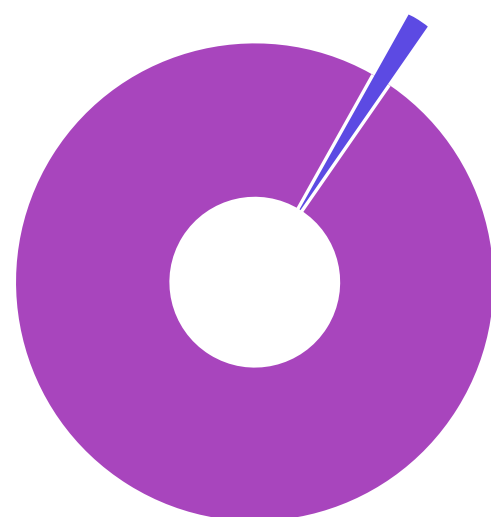
Jumlah peruntukan
keseluruhan
Total budget

RM81,929,477.00

Prestasi perbelanjaan
Expenditure

**RM81,024,121.18
(98.89%)**

Peruntukan Belanja Mengurus



BAKI : 1.11%

BELANJA : 98.8%

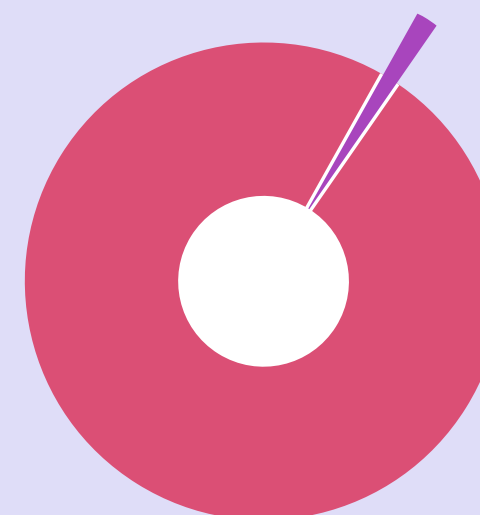
BAJET PEMBANGUNAN DEVELOPMENT BUDGET

Jumlah peruntukan
keseluruhan
Total budget

RM7,618,473.00

Prestasi perbelanjaan
Expenditure

**RM7,582,584.00
(99.53%)**



Peruntukan Belanja Pembangunan

BAKI : 0.47%

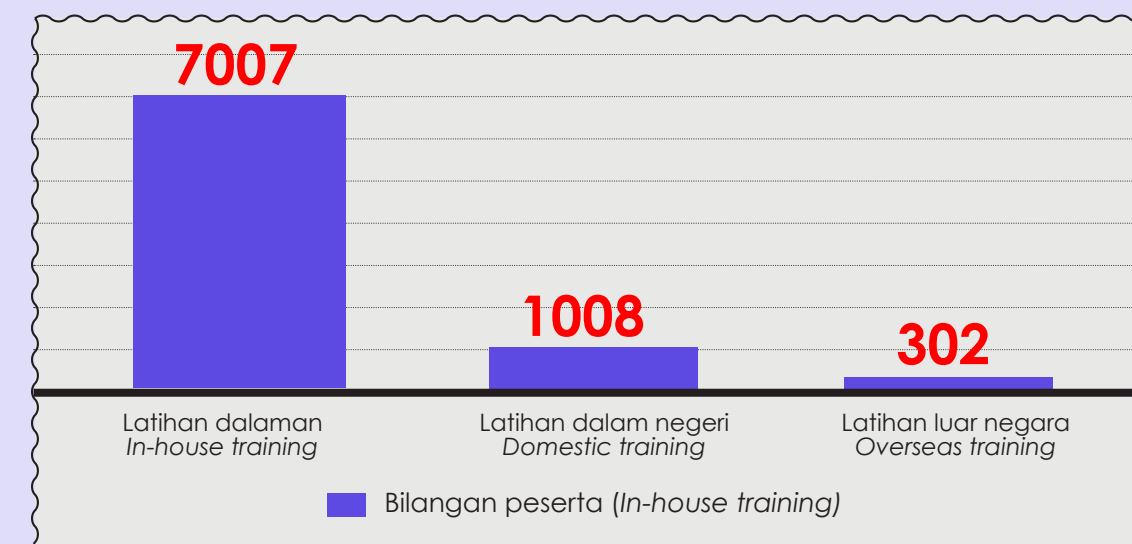
BELANJA : 99.53%

Pembangunan MODAL INSAN

Nuklear Malaysia sentiasa menitik-beratkan keperluan pembangunan modal insan bagi menyokong keupayaan dan kepakaran dalam bidang sains dan teknologi nuklear. Personel dilatih untuk berpengetahuan dan mahir, dan banyak program latihan dirancang dan dilaksanakan dengan tujuan ini.

HUMAN CAPITAL Development

Nuklear Malaysia emphasises the need for human capital development to support the capabilities and expertise in nuclear and science technology. The personnel are trained to be knowledgeable and skilful, and many training programmes were designed and executed with these goals in mind.



Bilangan Peserta Mengikut Kategori Latihan bagi Tahun 2018
Number of Participants according to Training Category for 2018

Nuklear Malaysia menyediakan program latihan pakar dalam sains dan teknologi kepada kakitangannya dan dari organisasi lain di dalam dan di luar negara. Seramai 257 pegawai terlibat dalam perkongsian pengetahuan dan program latihan dalam 1,857 aktiviti pakar.

Aktiviti ini merangkumi perkhidmatan pakar, perunding, panel penilaian, pengadil, pengadil luaran, juruaudit, editor, kuliah dan penyelia pelajar dari institusi pengajian tinggi. Rajah ini menggariskan bilangan perkhidmatan pakar yang disediakan oleh kakitangan Nuklear Malaysia dan peranan program ini.

Nuklear Malaysia provide expert training programmes in science and technology to its own personnel and those from other organisations within and beyond the country. A total of 257 officers partook in the sharing of knowledge and training programmes in 1,857 expert activities.

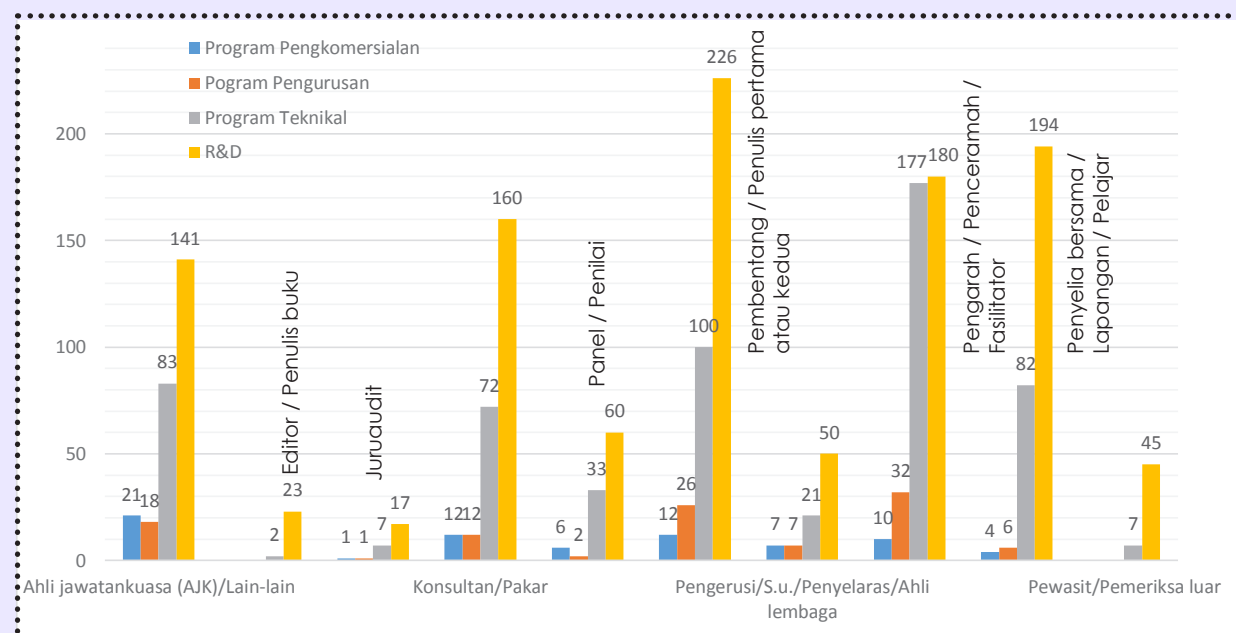
The activities encompass expert services, consultants, evaluation panels, referees, external referees, auditors, editors, lecturer, and supervisors of students from institutions of higher learning. The diagram below outlines the number of expert services provided by Nuklear Malaysia personnel and the role of these programmes.

PROMOSI SAINS DAN TEKNOLOGI NUKLEAR

Nuklear Malaysia menjalankan aktiviti promosi dan penyebaran maklumat untuk meningkatkan tahap kesedaran awam terhadap S&T nuklear secara berterusan. Aktiviti ini dijalankan di bawah Program Pembudayaan Sains Teknologi dan Inovasi (STI) 2018 seperti Minggu Sains Negara (MSN). Pada MSN 2018, Nuklear Malaysia menjalankan pelbagai aktiviti kesedaran awam dan pameran di sekitar Negeri Sembilan. Program pameran juga diadakan atas jemputan pihak sekolah di seluruh Malaysia. Nuklear Malaysia juga menerima pelawat luar dari pelbagai agensi dan institusi pendidikan. Liputan media cetak dan elektronik turut memaparkan kejayaan Nuklear Malaysia.

NUCLEAR SCIENCE AND TECHNOLOGY PROMOTION

Nuklear Malaysia executes promotional activities continuously towards increasing public awareness of nuclear technology. These activities were executed under the purview of "Program Pembudayaan Sains Teknologi dan Inovasi (STI) 2018" such as the National Science Week (MSN). On MSN 2018, Nuklear Malaysia took part in many public awareness programs and exhibition around Negeri Sembilan. Exhibitions were also held as per invites from schools across the country. Nuklear Malaysia also received international visitors involved in the research, development, and application of nuclear technology. Print and electronic media also reported the success of Nuklear Malaysia in these endeavours.



Bilangan Khidmat Kepakaran yang Diberikan oleh Pegawai Nuklear Malaysia Mengikut Program dan Peranan Aktiviti
Number of Expertise Services Provided by Nuklear Malaysia Officers in Accordance to Programme and Role of Activities



Minggu Sains Negara (MSN) 2018
National Science Week (MSN) 2018

