

# Growing Nuclear Applications for Sustainable Development of Asian Countries

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# MALAYSIAN NUCLEAR AGENCY

## Main Complex



# Contents

- Introduction
- Current Nuclear Application Activities of Nuclear Malaysia- A Brief Account
- Proposed Future Planning/Roadmaps
- Technology and Human Resource Requirements
- Challenges and Issues
- Conclusions

# MALAYSIAN NUCLEAR AGENCY

## **VISION**

Nuclear Technology for Knowledge Generation,  
Wealth Creation and Societal and National  
Well-being

## **MISSION**

Excellent in Research & Applications of Nuclear  
Technology for Sustainable Development

# FUNCTIONS OF NUCLEAR MALAYSIA

As stipulated in the Ministers of the Federal Government (Amendment) Order (No. 2) 2008 (P.U. (A) 170) under the Ministerial Functions Act of 1969, made on 19 March 2008, as was gazetted in the Government Gazette Vol. 52, No. 11, dated 29 May 2008, the functions of the Malaysian Nuclear Agency are as follows:

- ❑ *Conduct research and development (R&D), services and training in nuclear technology for national development;*
- ❑ *Promote the application, transfer and commercialization of nuclear technology; and,*
- ❑ *Coordination and management of nuclear affairs at national and international levels and as liaison agency for the International Atomic Energy Agency (IAEA).*

In addition to these functions, the Cabinet had decided, on 24 June 1998, to designate the Malaysian Nuclear Agency or MINT, as it was still known as then, as the National Authority for the Comprehensive Nuclear Test-Ban Treaty (CTBT) in accordance with the provisions of the Treaty itself.



**GAMMA IRRADIATION**



**SECONDARY STANDARD  
DOSIMETRY LAB (SSDL)**



**REACTOR TRIGA  
PUSPATI**



**RADIOACTIVE WASTE  
MANAGEMENT CENTER**



**RADIOCHEMICAL &  
ENVIRONMENTAL LAB**



**NON-DESTRUCTIVE  
TEST (NDT)**



**NUCLEAR MALAYSIA  
TRAINING CENTER**

## MAIN FACILITIES (14)



**CTBTO RADIONUCLIDE  
MONITORING STATION**



**ISOTOPE  
PRODUCTION LAB**



**ELECTRON BEAM**



**WASTE & ENERGY  
TECHNOLOGY LAB**



**RAYMINTEX**



**GAMMA GREEN  
HOUSE**



**TISSUE BANK**

# NUCLEAR MALAYSIA:

## Products

### AGRICULTURE



### MEDICAL

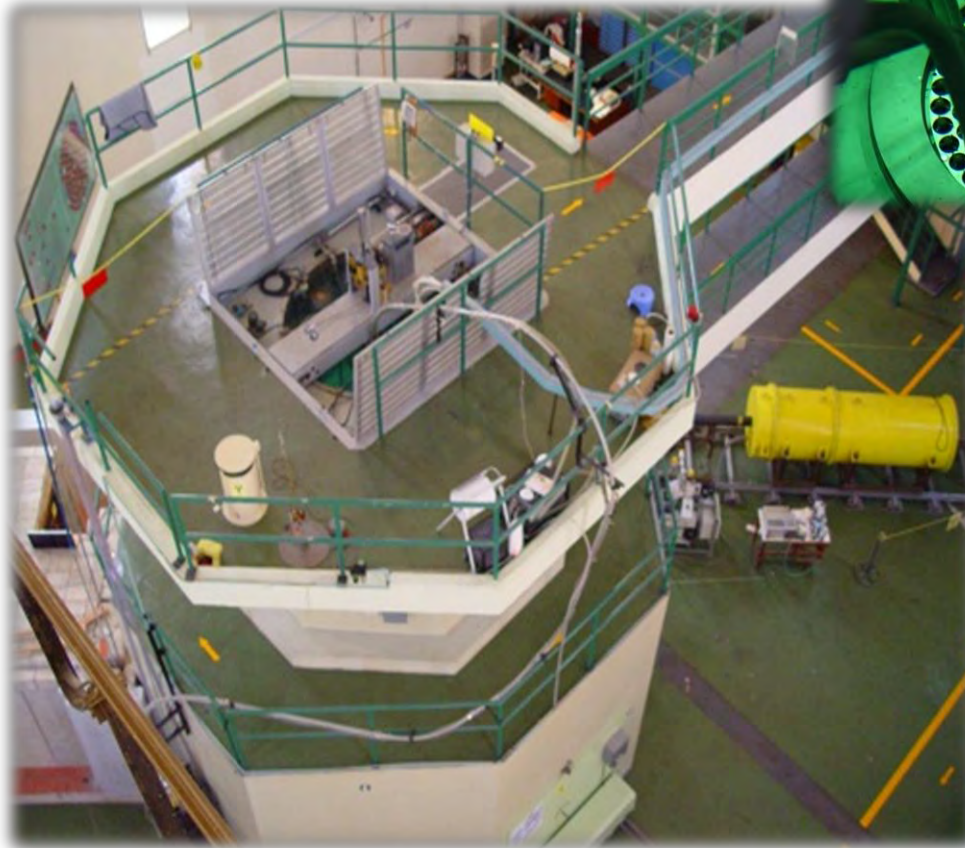


### MANUFACTURING



# Reaktor TRIGA PUSPATI (RTP)

- NAA
- Isotopes
- Neutron Beam Application
- Education and Training



# Co-60 Irradiator (SINAGAMA)

- Food and herbs irradiation
- Medical disposable



# SSDL

- Dosimeter Calibrations
- Consultations



# Rubber Latex Vulcanization (RAYMINTEX)

- Rubber Vulcanization
- Chitosan Irradaition



# Electron Beam Machine (ALURTRON)

- x-link
- Grafting
- sterilization
- Surface Treatment



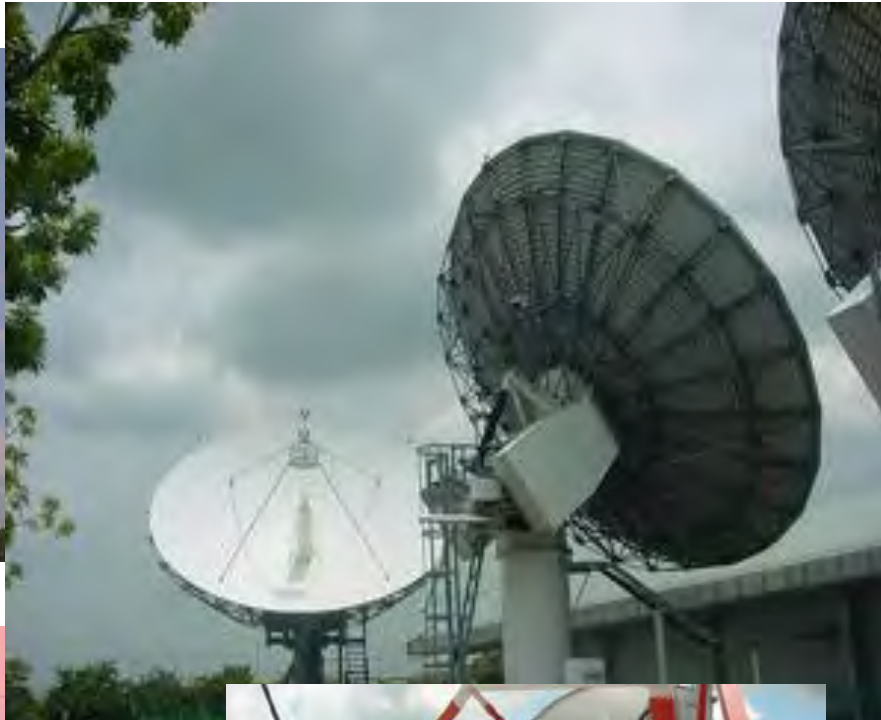
# Rad Waste Treatment

- Services and Consultancies



# NIR

## •R&D and Consultancies



# Radioisotop Laboratory

- Medical application



# Industrial Application

- Oil and Gas Industry
- R&D and Services



# Medical sector

- Tissue Bank





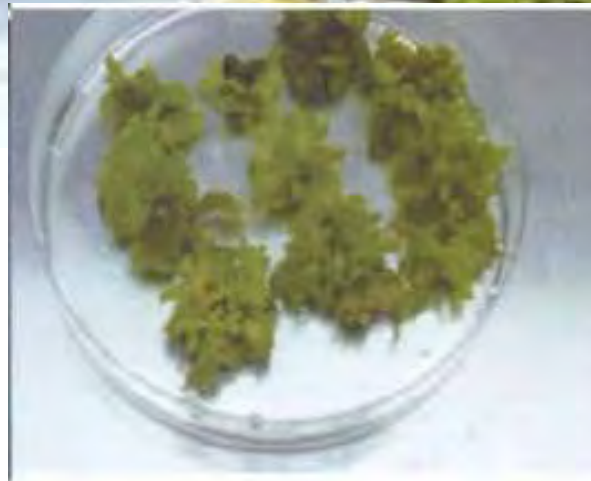
# Environment

- Industrial pollution
- Landfill contamination
- Dams seepage



# Flora Center Nuklear Malaysia

- Mutation Breeding



## Mutation breeding



**Sweet & Karisma Serene**



***Dendrobium* „Sonia Keena  
AhmadSobri“**



**Siti Hasmiah „Pink  
Beauty“**



**Novaria  
*Musa paradisiacal***



**Grass “KLUANG  
Comel”**

# Mutation Breeding

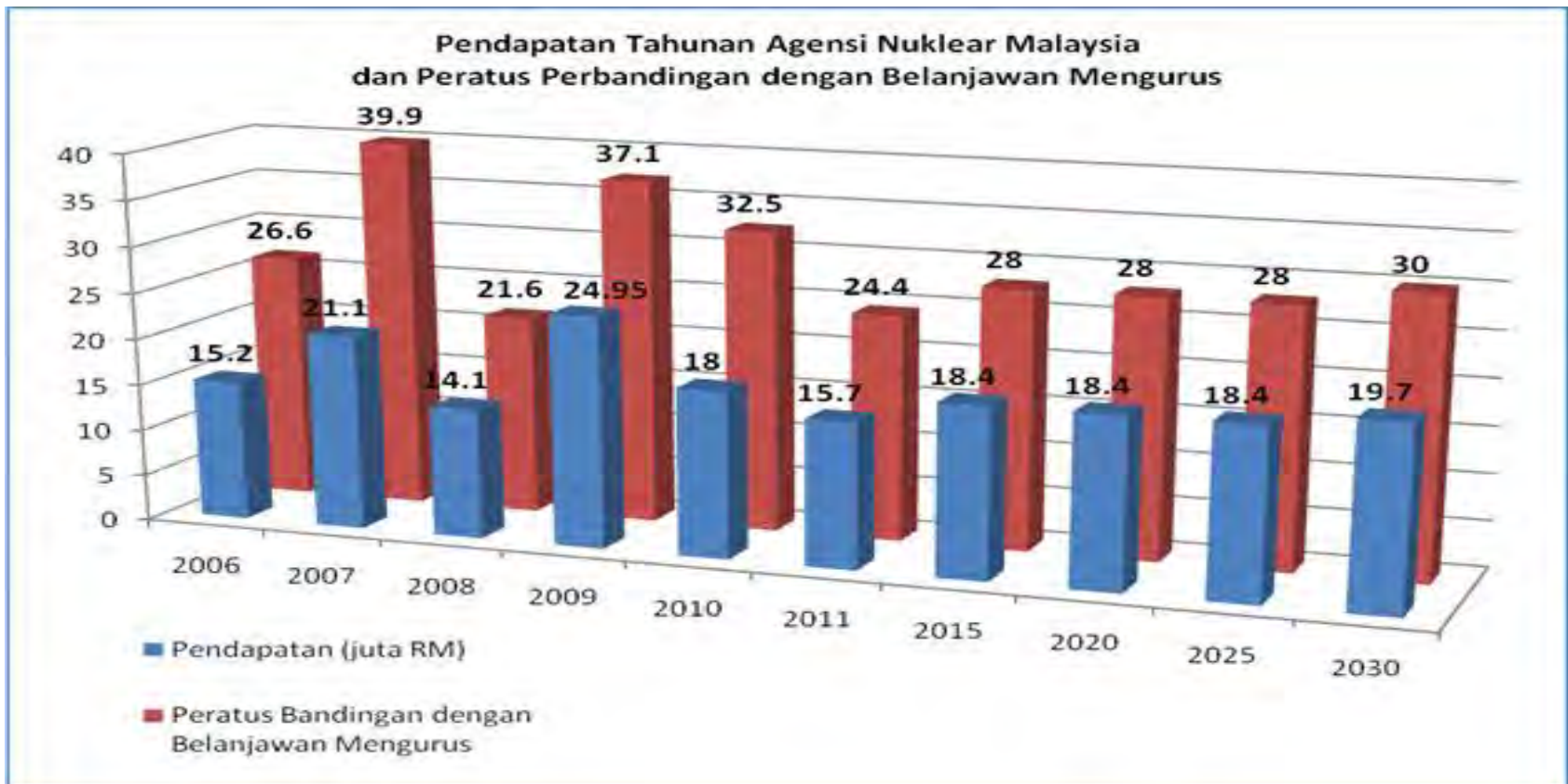


# REVENUES FROM COMERCIAL OPERATIONS

BLUE BARS = MILLION RINGGITS

RED BARS= PERCENT COMPARED TO OPERATING BUDGET

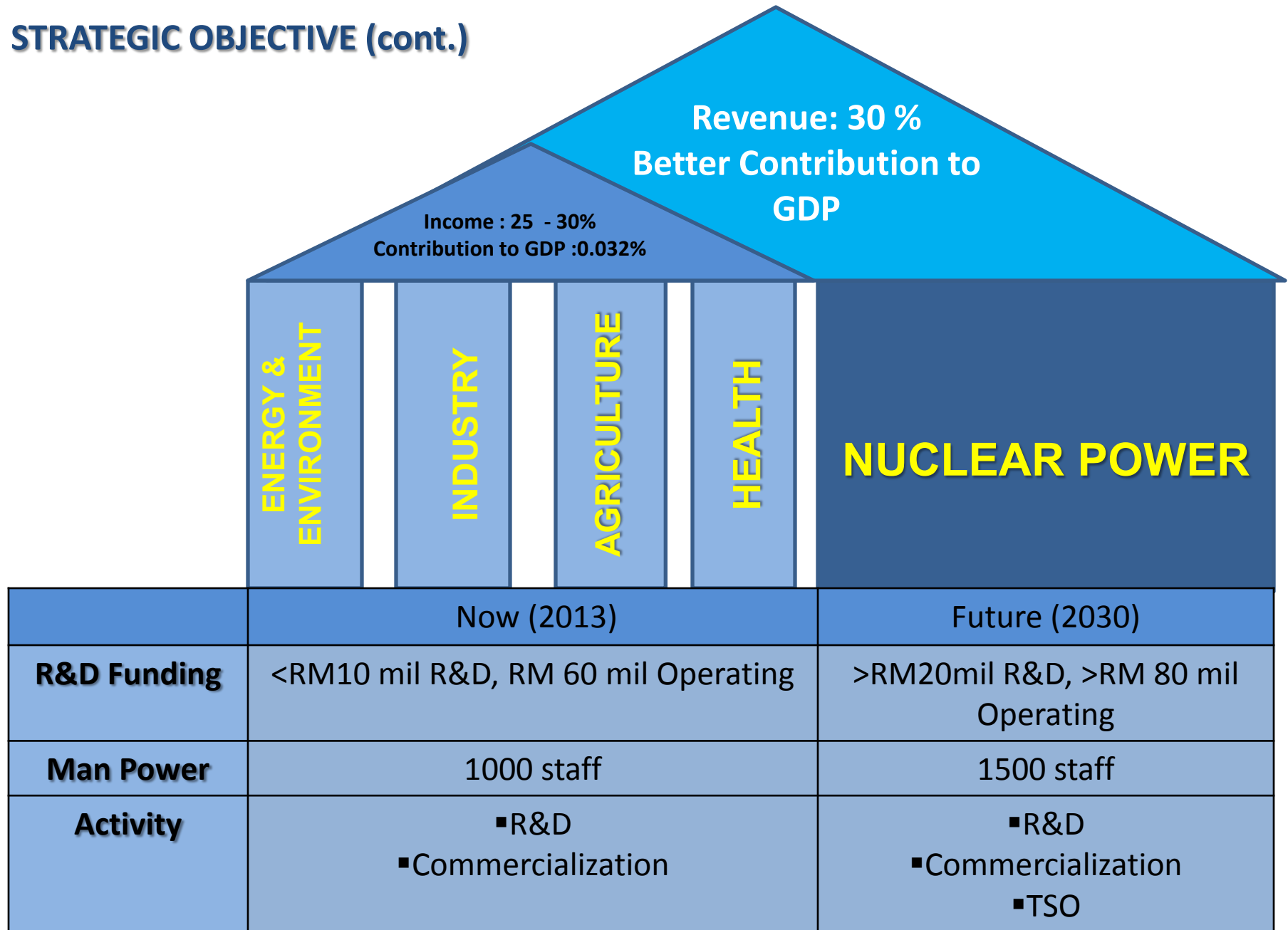
CUSTOMERS=MORE THAN 6000 (2013)



# Revisiting OBJECTIVES

- To realize the function and values of Technical Support Organization (TSO) for nuclear power industry
- To Enhance Nuclear Application R&D and Technical Services (Maintaining 30% of the annual operating budget).
- To contribute significantly to the National GDP through nuclear energy and technology application

## STRATEGIC OBJECTIVE (cont.)



# PROPOSED ROADMAP FOR RESEARCH & DEVELOPMENT (R&D)

Short Term

Medium Term

Long Term

## ENERGY & ENVIRONMENT

### EPP 11: Deploying Nuclear Energy for Power Generation

- Development of Nuclear Fuel Cycle , including nuclear waste management
- Material and Structural Integrity Evaluation
- Nuclear Impact Assessment
- Reactor Technology and Nuclear Safety
- Nuclear Knowledge Management

- Network on Reference Lab for Environmental Assessment & Resources

## AGRICULTURE

### EPP 1: Uploading value for Malaysia biodiversity through value herbal product

- Standardized Herbal Entities (SHE) for anticancer and anti-diabetic
- Improvement of crop & food quality using nuclear technology
- Generation of new plant varieties using Protoplast fusion and Cell Culture

### EPP8: Strengthening the export capability of the processed food industry through an integrated processed food park

- Food Irradiation

### EPP11: Scaling up and strengthening productivity of paddy farming in other irrigated areas

- Enhancement of yield and insect resistant paddy for sustainable agriculture through nuclear and related technology

## MEDICAL

### EPP 2: Creating a supportive ecosystem to grow clinical research

- Cyclotron Based Research, fusion of nuclear and phytotech

- GMP Plant for Medical and Pharmaceutical Products

## INDUSTRY

### EPP 2 (Business Opportunity) : Building globally competitive outsourcers

- Localization - Development of Accelerator Based Radiation Source
- Localization – Development Nuclear Industrial and Medical Devices



# PROPOSED ROADMAP TOWARDS TSO

## Short Term

## Medium Term

## Long Term

- Environmental Monitoring Programme for NPP operation
- RIA Study ( also in support of LYNAS issue)

- National Nuclear Training Centre (in RMk 10) and joint NM-Universities Education and Training to support NPP

- National Nuclear Information Circulation Centre (NUCLEAR GARDEN)

- National Policy on Safe and Secure Management of Radioactive Waste (Both High & Low Levels)
- National CTBT Act
- IAEA Integrated Work Plan (IWP)
- Additional Protocol & Agreement 123
- New Structure and Status

- Regional Nuclear Reference Information Centre

- Centre of Excellence for radiation , nuclear safety, reactor technology , plant integrity and waste management with added physical infrastructure to support new roles and functions

- Recognized Centre of Excellence for Nuclear Security and Safeguard (non-regulatory)

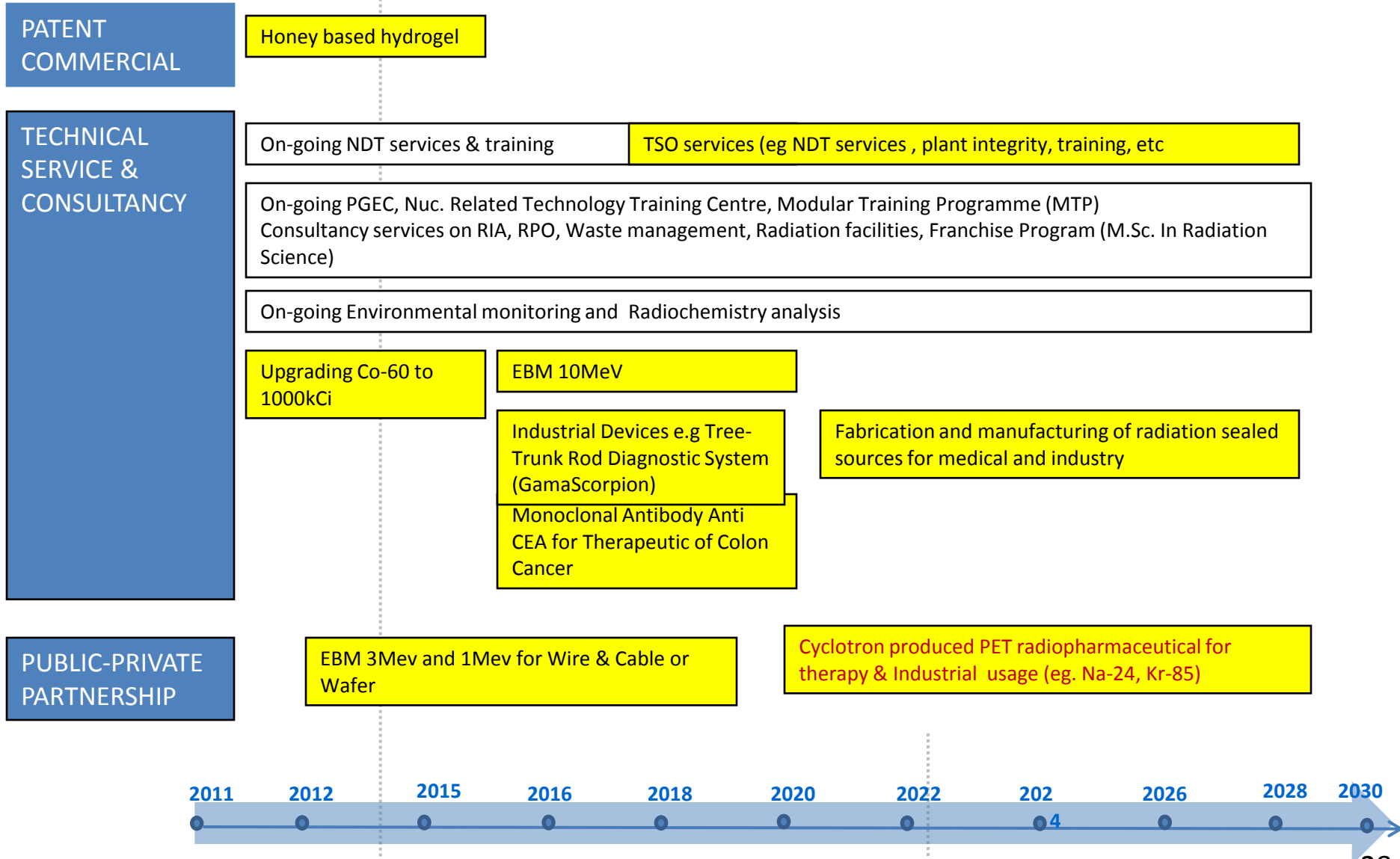
20MW nuclear reactor for radioisotope production, material testing, silicon doping, education and training, with the associated Laboratories

- Public Information/Acceptance

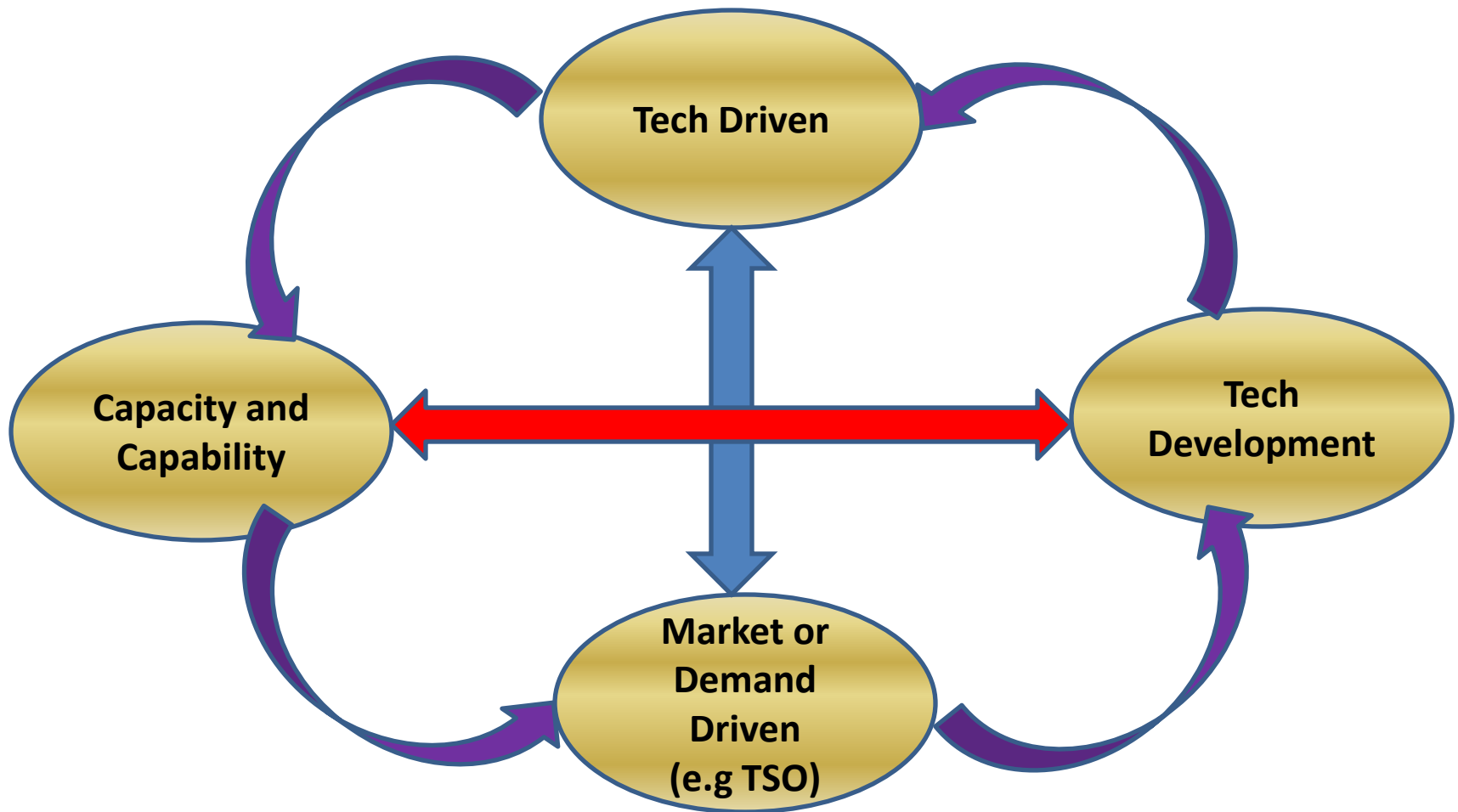
- Nuclear Malaysia as TSO

2011 2012 2014 2016 2018 2020 2022 2024 2026 2028 2030

# PROPOSED ROADMAP ON COMMERCIALIZATION



# Nuclear Capabilities and Technology Development



# PROPOSED ROADMAP FOR CAPACITY BUILDING : NUCLEAR POWER PROGRAMME

## Short Term

Capacity Building to prepare for technology absorption from vendor, consultant and donor countries/bilateral/multilateral to support NPP deployment

Capacity building in NPP R&D to become TSO for industry

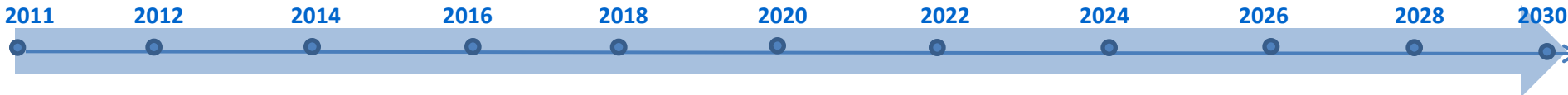
## Medium Term

Capacity building in NPP R&D to support sustainability in NPP

## Long Term

On-going capacity building for nuclear technology development (Non-Power)

On-going training and capacity building from Nuclear Malaysia Training Center, Education and Training Program



# PROPOSED ROADMAP FOR NPP HCD : ADDITIONAL MAN POWER

Short Term

Medium Term

Long Term

- ☐ Metallurgy and Material Science  
(Professional: 20; Technician: 35)
- ☐ Chemistry and Chemical Eng.  
(Professional: 30; Technician: 40)
- ☐ Reactor Physics  
(Professional: 15; Technician: 10)
- ☐ Thermo Hydraulics  
(Professional: 20; Technician: 20)
- ☐ Safety Research Analysis  
(Professional: 10; Technician: 5)
- ☐ Fuel Engineering  
(Professional: 25; Technician: 40)
- ☐ Control and Instrumentation Eng.  
(Professional: 30; Technician: 40)
- ☐ Component Development  
(Professional: 20; Technician: 25)
- ☐ Environmental Studies and Waste Management  
(Professional: 50; Technician: 40)
- ☐ Health Sciences  
(Professional: 10; Technician: 10)
- ☐ Basic Research  
(Professional: 20; Technician: 20)

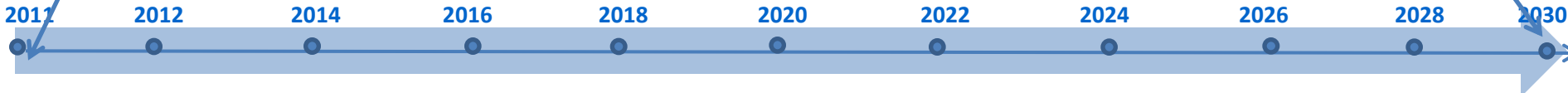
New Additional Staff  
Required for TSO  
(Ref: IAEA)

**2011**

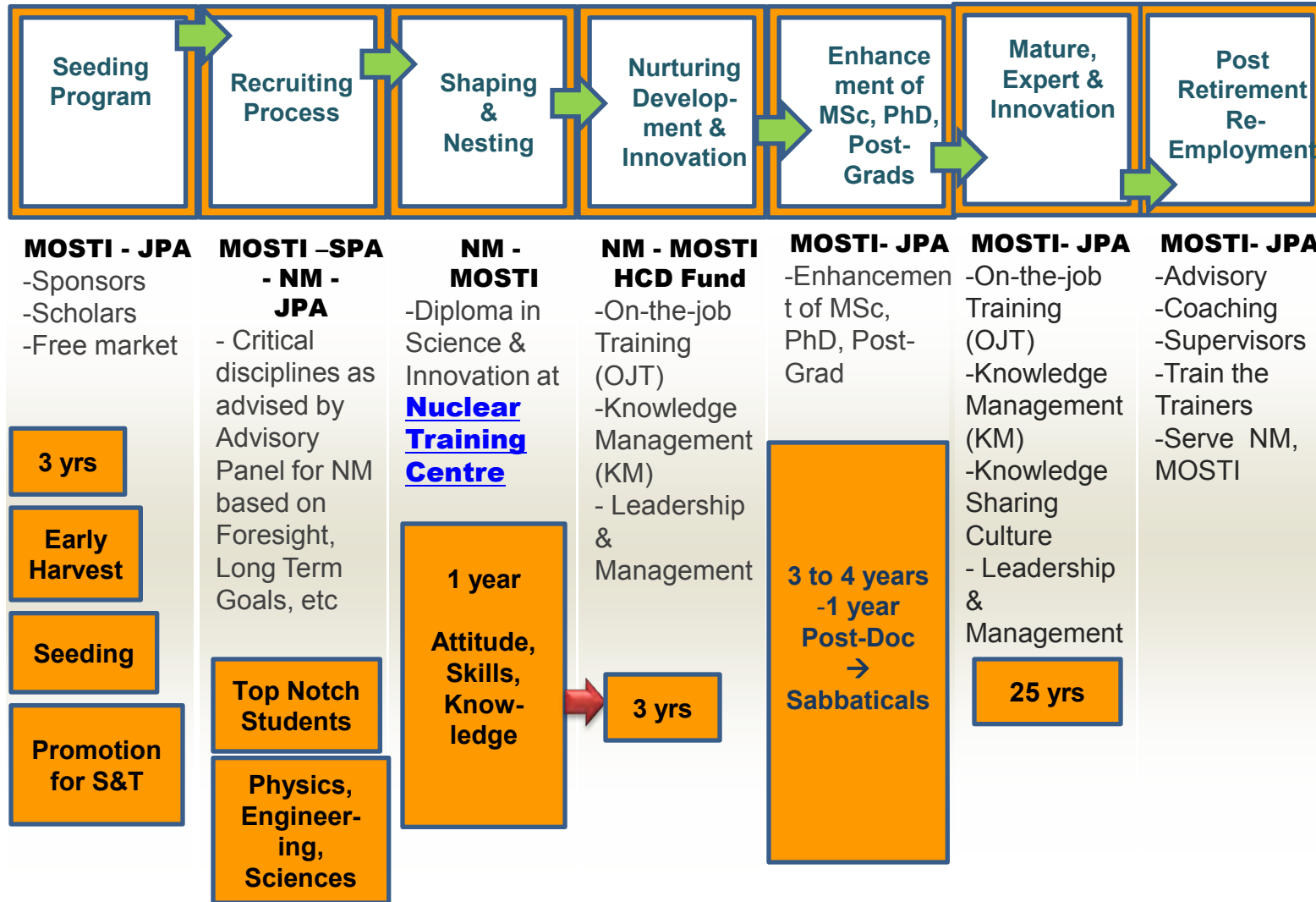
17.4% Phd.  
(62 Personnel)  
31.2 % Msc.  
( 111Personnel)

**2030**

60% Phd. (237 Personnel)  
30% Msc. (177 Personnel)



# PROPOSED QUALITY WORKFORCE PRODUCTION MODEL



**Critical Mass: 700-800??**

# The Challenges and Issues

- Nuclear Malaysia TSO Transformation
  - Is it real?
- Human Capital: Capacity and Capabilities
  - Knowledge Management/Retiring Staff
  - NPP requirements? Public Acceptance wrt Safety and Nuclear waste
  - Nuclear Applications and Commercialization
- Funding/Budget and Timing
  - To increase the R&D funding
  - To increase the HRD funding
  - Is it possible and realistic?

# Conclusion

- For the past 40 years, Nuclear Malaysia has successfully emerged into one of the successful nuclear research center, however, the progress rate is still far behind developed countries. Thus Nuclear Application destiny in Malaysia is still far from saturation.
- Should Nuclear Malaysia Become TSO for NPP, there is a high chance of building new capacity and capabilities and assured substantial funding from the government. The challenge lies in the NPP realization.
- The Nuclear Application Sector will Enjoy the benefits from the above development and will contribute to more vigor technology development and commercialization. The progress rate of Nuclear Technology Application will be accelerated along with the above.

Thanks