Regional Workshop on the Management of Training System for Nuclear and Radiation Safety

International Atomic Energy Agency – Asian Nuclear Safety Network (IAEA-ANSN)

14 -18 November 2022 | Manila, PHILIPPINES

National Strategy on Capacity Building in Nuclear and Radiation Safety

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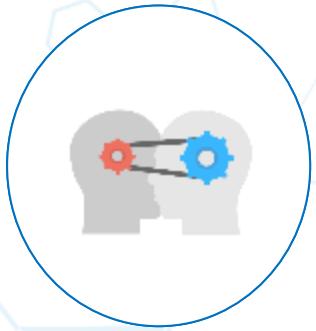
Content

1: Stakeholders

2: Education and Training Infrastructure

3:Training and Competence Assessment



4: Knowledge Management

5: Peer Review Assessment

6: Educational Networks

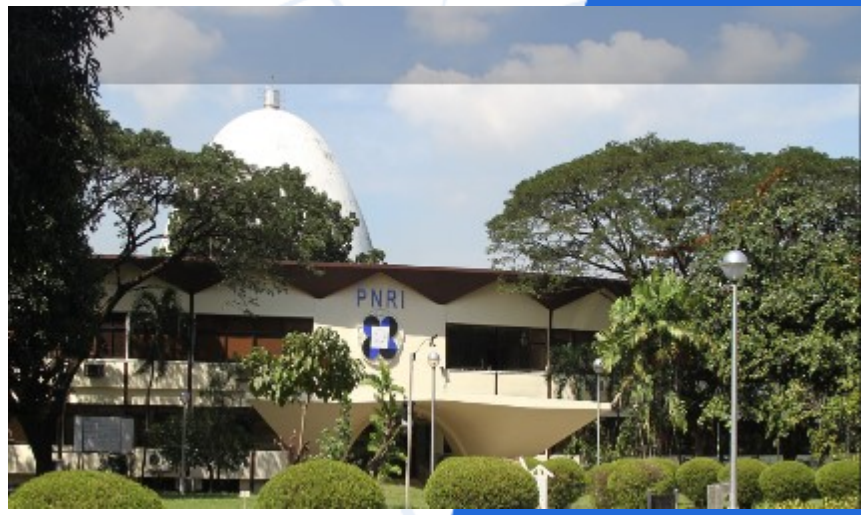
Stakeholders

- Government - National Nuclear Authority (PNRI)
- Regulatory Body (PNRI - NRD) and DOH-CDRRHR*
- Technical Support Groups (PNRI – Technical Divisions)
- Licensees (Entities/Facilities handling radioactive materials, Occupational Radiation Workers, Vendors, other service providers)

*Center for Device Regulation, Radiation Health, and Research

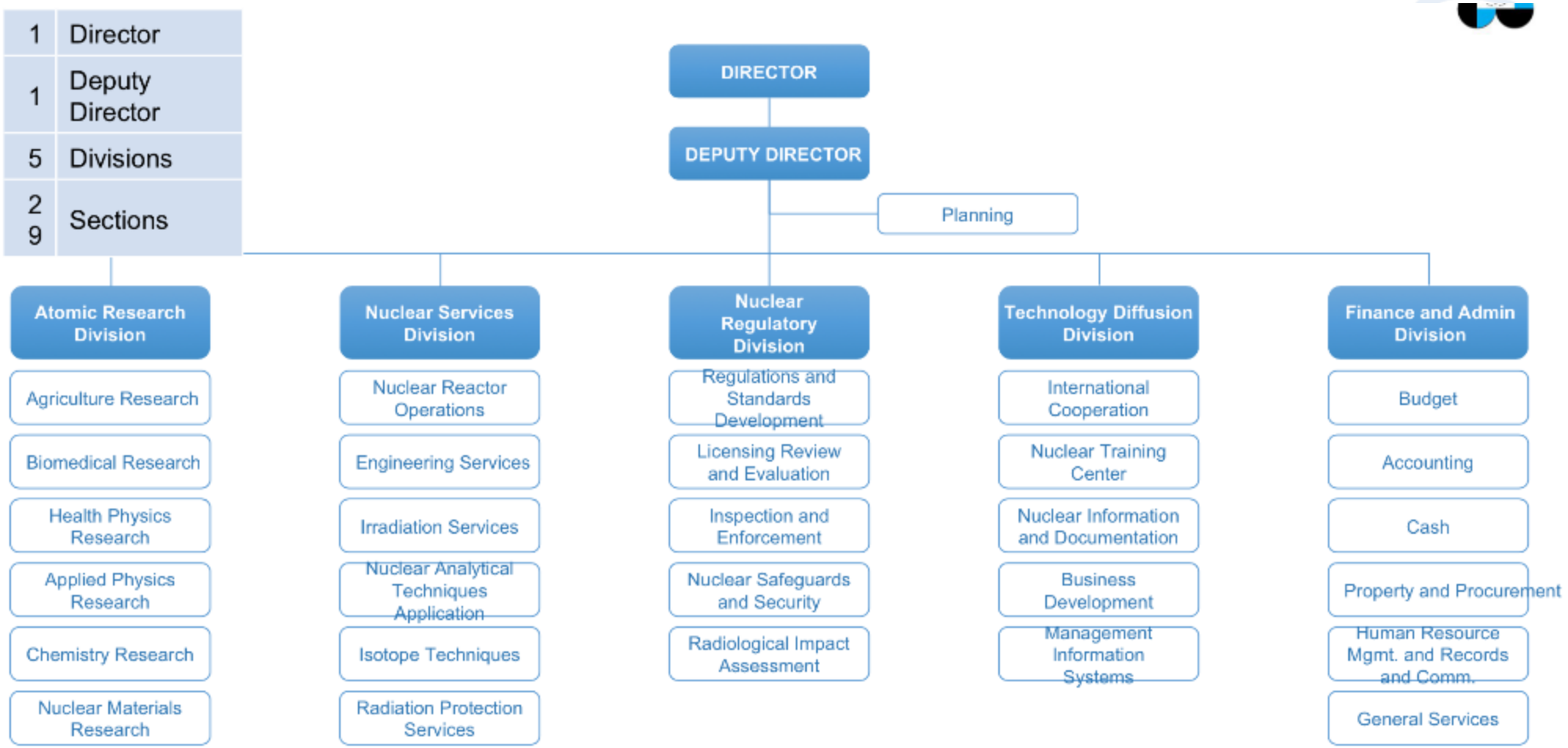
The Philippine Nuclear Research Institute

- Conduct research and development on the application of radiation and nuclear techniques, materials and processes;
- Undertake the **transfer of research results to end-users, including technical extension and training services;**
- Operate and maintain nuclear research reactors and other radiation facilities; and
- **License and regulate activities relative to production, transfer and utilization of nuclear radioactive substances development**



PNRI's Organizational Chart

1	Director
1	Deputy Director
5	Divisions
29	Sections



Education and Training Infrastructures

- PNRI – Nuclear Training Center
- PNRI – Sub-Critical Assembly for Training, Education and Research (SATER) Facility
- Tertiary Nuclear Education – Radiology, Medical Physics
- PNRI Nuclear Education Initiatives – core and elective subjects in undergraduate and graduate Engineering Programs

PNRI Nuclear Training Center

- FTCs on JAEA's Instructors Training Courses
  - Reactor Engineering
  - Emergency Preparedness
  - Environmental Radioactivity Monitoring
- Course on Basic Nuclear Science

- Radiation safety courses (8)
- Technology diffusion courses (5)
- Radiological emergency preparedness
- Environmental monitoring courses
- Nondestructive testing (NDT) training course (12)

Full Course Nuclear Education Programs

1. MSc in Applied Physics, major in Medical Physics
2. Master in Medical Physics

3. BSc Pre-Med Physics (applications of physics in Medicine)

Undergraduate programs on Radiologic Technology

PNRI Nuclear Education Initiatives

Partnerships forged (MOUs)

- **University of the Philippines (UP) Diliman** (2018, renewed in 2021)
  - Two PNRI staff granted Professional Lecturer posts in UPD, others are adjunct
- **Mapua University** (2020)
  - Five PNRI staff with lecturer posts in MAPUA

Integration of nuclear education

- UP Diliman – **MSc / Ph.D. Energy Engineering**
  - Core subject, 3 units: Nuclear Energy (since 2019)
  - Elective subject, 3 units: Introduction to Nuclear Engineering (started 2022)
- Mapua University – BSc Chemical Engineering
  - Elective subject, 9 units: Nuclear Engineering Track (since 2020)
- Mapua University – MSc/PhD in Environmental Engineering
  - Elective, 3 units: Introductory Nuclear Environmental Engineering (started 2022)

Students thesis/dissertation research studies focused on NST

- University of Santo Tomas (MSc); UP Diliman (MSc); Mapua (BSc)

PNRI Nuclear Education Initiatives

Curriculum in MSc Nuclear Science and Engineering (2020)

- Developed with IAEA Expert: Wahlid Metwally, Sharjah University, UAE
- Core courses
  - Nuclear Engineering Fundamentals
  - Nuclear Fuel Cycle
  - Nuclear Reactor Analysis
  - Radiation Detection and Measurement
  - Nuclear Seminar (1 credit), minimum of two
- Specialization tracks
  - Radiation Applications track
  - Nuclear and Radiation Safety
  - Nuclear Security

University of the Philippines College of Engineering

- Framework in Nuclear Engineering (2021)

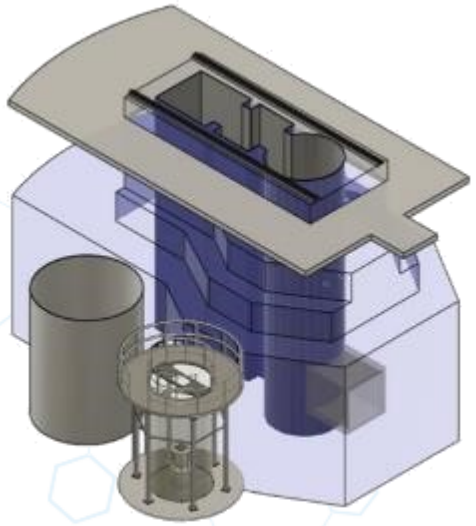
PNRI Nuclear Education Initiatives

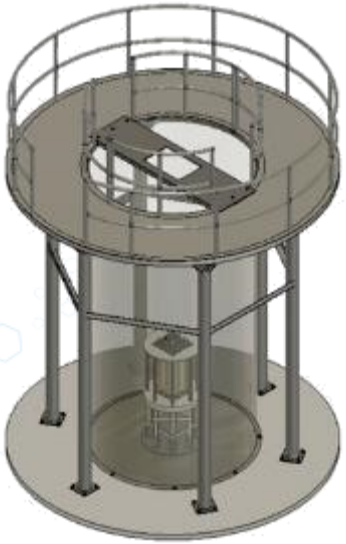
- *Educational Program and Facility Exposure*
  - ***Texas A&M University, USA (UPD-Engineering, MAPUA, CLSU, MSU-IIT, PNRI)***
  - ***Modality applied by a university with long established nuclear education programs in a country without a NPP*** – *Chulalongkorn University, Thailand (UPD Engineering, UST Engineering, MAPUA, Ateneo de Manila University, PNRI-NTC)*
  - ***Modality applied by an International Centre based on Research Reactors (ICERRs)*** – *KAERI South Korea (UPD Engineering, UPD-College of Science, MSU-Iligan Institute of Technology, MAPUA, University of San Carlos, UST Physics and Mathematics, Ateneo de Manila University, PNRI)*
  - ***Modality applied by a university with long established nuclear education programs in a country operating a NPP*** – *Czech Technical University, Prague (UPD-Engineering, UP-Manila, MAPUA, Technological Institute of the Philippines, Bicol State University, PNRI)*
  - ***Modality applied by a university with recently established technical education program (Polytechnic nuclear education)*** *in a country without a NPP – Polytechnic Institute of Nuclear Technology, Indonesia (UPD-Engineering, MAPUA, Polytechnic University of the Philippines, Technological University of the Philippines, **TESDA,** PNRI)*

PNRI PRR-1 SATER

PRR-1 SATER

Commissioned in June 2022





SUPPORT nuclear manpower development

ACCOMMODATE local access to an operating nuclear facility

TRAIN reactor operators, user, and regulators

ENGAGE stakeholders in nuclear and reactor engineering

REPURPOSE resources of historical PRR-1 facility

Facility Objectives

PNRI PRR-1 SATER

UTILIZATION PLAN

FULL

1 PUBLIC AWARENESS

- Conduct of Awareness Seminars
- Technical Visits
- Public Communication for Peaceful Use of Nuclear Energy

FULL

2 NUCLEAR EDUCATION

- Reactor Physics and Engineering
- Neutron Physics
- Dosimetry
- Nuclear Safety
- Reactor Experiments
- Practical Training of Students

MEDIUM

3 CAPACITY BUILDING FOR NUCLEAR POWER

- Reactor Physics and Engineering
- Reactor Operation
- Nuclear Safety
- Nuclear Security
- Nuclear Material Accounting and Control
- Nuclear Facility Regulation

LOW

4 R&D/SERVICES

- Neutronic and Reactor Kinetic Studies
- Reactor Model Validation
- Neutron Spectrometry
- Small-Scale Neutron Activation Analysis
- Low Flux Neutron Irradiation

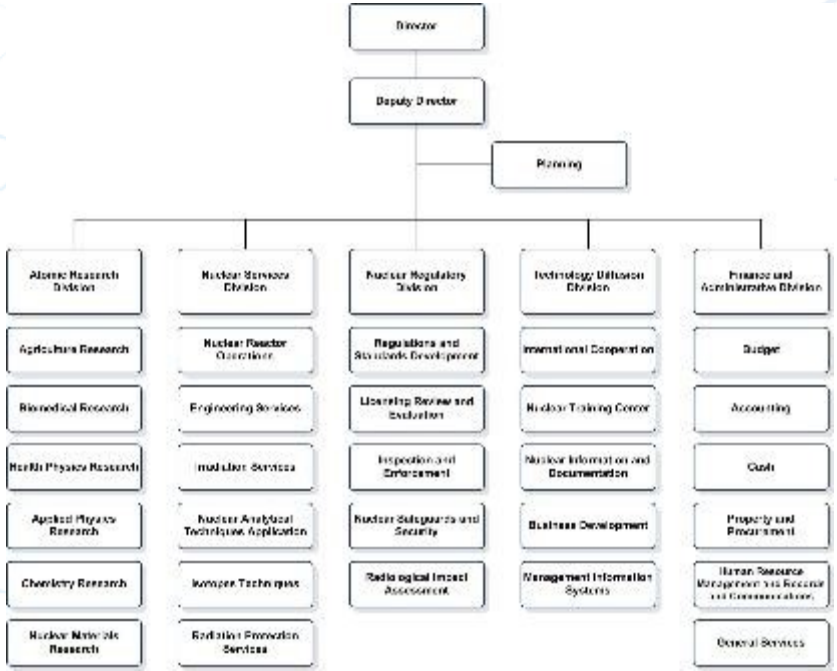
PNRI Nuclear and other Alied Facilities

Multipurpose Gamma Irradiation Facility

Electron Beam Irradiation Facility

Self-shielded Gamma Irradiator

- *Radioactive Waste Management Facility*
- *Nuclear Analytical Techniques Laboratory*
- *Isotope Techniques Laboratory*
- *Radiation Protection Facilities*
- *Applied Physics Laboratory*
- *Health Physics Laboratory*
- *Chemistry Research Laboratory*
- *Biomedical Research Facility*
- *Agricultural Research Facility*
- *Nuclear Materials Research Facility*



Competence and Training Needs Assessment

- The PNRI recognizes the importance of a competent workforce as essential to it's organization's success, as such, all of its employees shall be assessed regularly for competency on the tasks as defined in their job's duties and responsibilities.

Competence and Training Needs Assessment

4. Personal and Behavioral Competences

- 4.1 Analytical thinking and problem solving
- 4.2 Personal effectiveness and self-management
- 4.3 Communication
- 4.4 Team work
- 4.5 Managerial and leadership competences
- 4.6 Safety culture competence

1. Competences related to legal, regulatory and organizational basis

- 1.1 Legal Basis
- 1.2 Regulatory policies and approaches
- 1.3 Quality Management System

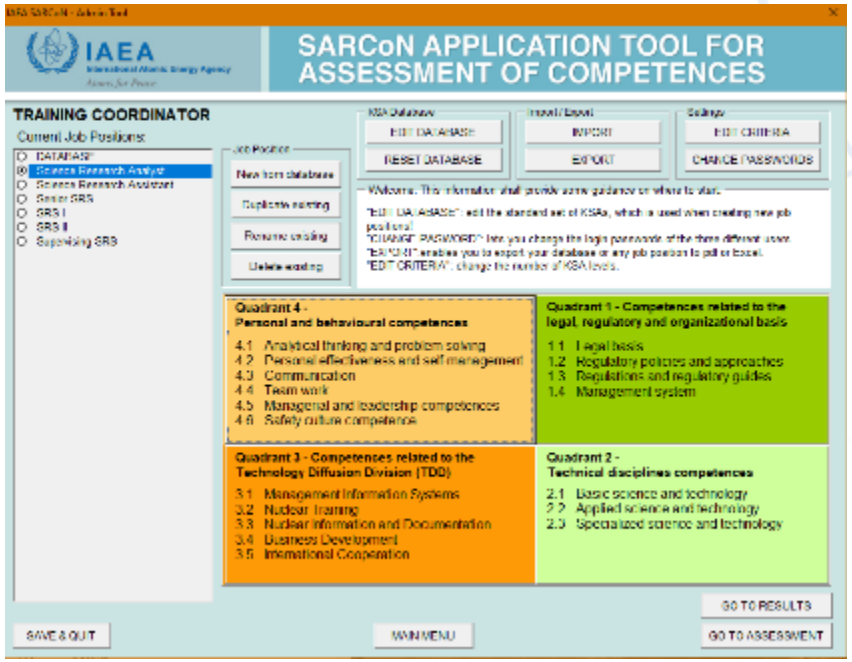
3. Competences relevant to Core Functions

- 3.1 Review and Assessment
- 3.2 Authorization
- 3.3 Inspection
- 3.4 Enforcement
- 3.5 Development of Regulations and Guides
- 3.6 Nuclear Safeguards Implementation
- 3.7 Radiological Impact Assessment
- 3.8 Technical Work Procedure and Techniques
- 3.9 Nuclear, Isotopic & Related Equipment and Facilities
- 3.10 Non-Nuclear Equipment and Facilities
- 3.11 Competencies in Finance/Administrative Functions

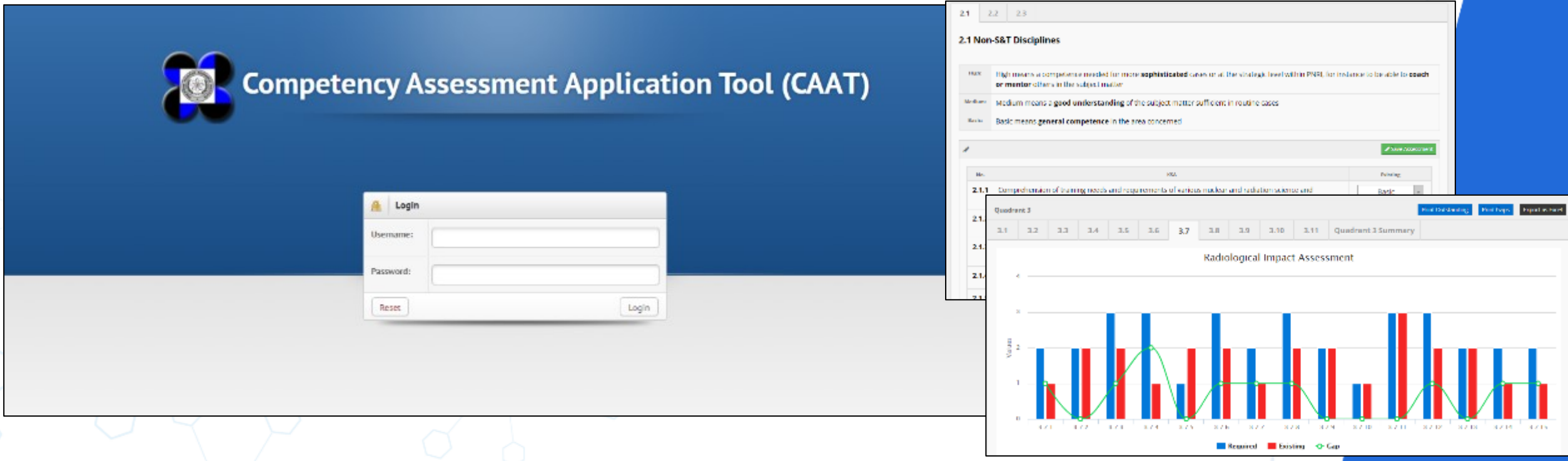
2. Technical Discipline Competences

- 2.1 Non-S&T Disciplines
- 2.2 Science and Technology Disciplines
- 2.3 Specialized Science and Technology Disciplines

IAEA's SARCON Tool



PNRI's Competency Assessment Tool



- A Web-based application tool used in the assessment of PNRI staff's capabilities against the required competencies of his/her job as defined in the PNRI's Competency Model.
- Adopted from the International Atomic Energy Agency's (IAEA) MSExcel-based Systematic Assessment of Regulatory Competence Needs (SARCoN)

Knowledge Management

- **KM Policy Statement of PNRI Policy Instruction No. 001, 22 August 2013, Series of 2013)**

"Nuclear Knowledge Management (NKM) as an Integral part of the Management System will foster Innovation in nuclear research and development, nuclear services, and technology diffusion through knowledge sharing, and enable appropriate and well-informed nuclear regulatory decision-making within the framework of the Philippine Nuclear Research Institute's (PNRI) objectives and goals. NKM will focus on identifying, creating, accessing, capturing, sharing, integrating and preserving knowledge assets and turn PNRI into a knowledge-based organization."

NOTE: The programme is implemented through a Nuclear Knowledge Management Committee. In 2018, the Committee was renamed simply as KM Committee to avoid confusion of its scope

Knowledge Management

- Knowledge Preservation and sharing components integrated into the PNRI's Quality Management System and Strategic Performance Management System (SPMS)
- PNRI QMS ISO9001:2015 contains all documented procedures of PNRI processes and work instructions which are stored in the PNRI Intranet accessible by all employees (continuously updated when improvements are done after every audit)
- The SPMS contains guidelines for mentoring and other forms of capturing tacit knowledge
- Creation of a PNRI Knowledge Database containing knowledge capacity Topic Experts
- Inventory of Critical Knowledge Resources
- Knowledge Management Survey for retiring/resigning employees
- Conduct of individual technical study groups
- Digitization of the BNPP FSAR and PSAR and other critical documents

Peer-review of nuclear / radiation safety infrastructures

- Q4-2022: Occupational Radiation Protection Assessment Service (ORPAS Mission)
- Q1-2023: Knowledge Management Assist Visit (KMAV Mission)
- 2024: INSERV (Nuclear Security)
- Q4-2023: Integrated Regulatory Review Service (IRRS Mission)

Nuclear Education Networks

- Asian Nuclear Safety Network (ANSN)
- International Network for Education and Training for Emergency Preparedness and Response (iNET-EPR)
- International Nuclear Security Education Network (INSEN)
- Asian Network for Education in Nuclear Technology (ANENT)
- International Nuclear Science and Technology Academy (INSTA)
- Other Regional Nuclear Knowledge Networks

LANENT AFRA NEST STAR-NET Regional Network for Education and Training in Nuclear Technology enen

BNEN NTEC Nuclear Technology Education Consortium UNENE University Network of Excellence in Nuclear Engineering

Nuclear Power Program in the Philippines

Activities supporting the Nuclear Power Program

DO2016-10-0013

Philippine Nuclear Energy Program Implementing Organization

2016

- IAEA-IFNEC conference recommended the creation of the NEPIO (Sept 2016)
- Ph DOE NEPIO was created (Oct 2016)

2017

2018

- IAEA INIR Mission completed (Dec 2018)
- DOE NEPIO was officially funded; First recommendation for national position (Apr 2018)

2019

- Public perception survey conducted, 79.0% approval/ acceptability (Apr-May 2019)

2020

- Executive Order 116 was issued, creating the NEP-IAC (July 2020)
- NEP-IAC workshop finalized the second recommendation for national position (Dec 2020)

2021

2022

- Executive Order 164 Adopting a National Position was issued (Feb 2022)

NEP-IAC

Executive order 116: Creation of the Nuclear Energy Program Inter-Agency Committee (NEP-IAC)

Executive Order No. 116 (issued on 24 July 2020)

- **Directing a study for the adoption of a National Position on Nuclear Energy Program (NEP)**
- **Establishing the Nuclear Energy Program Inter-Agency Committee (NEP-IAC)**

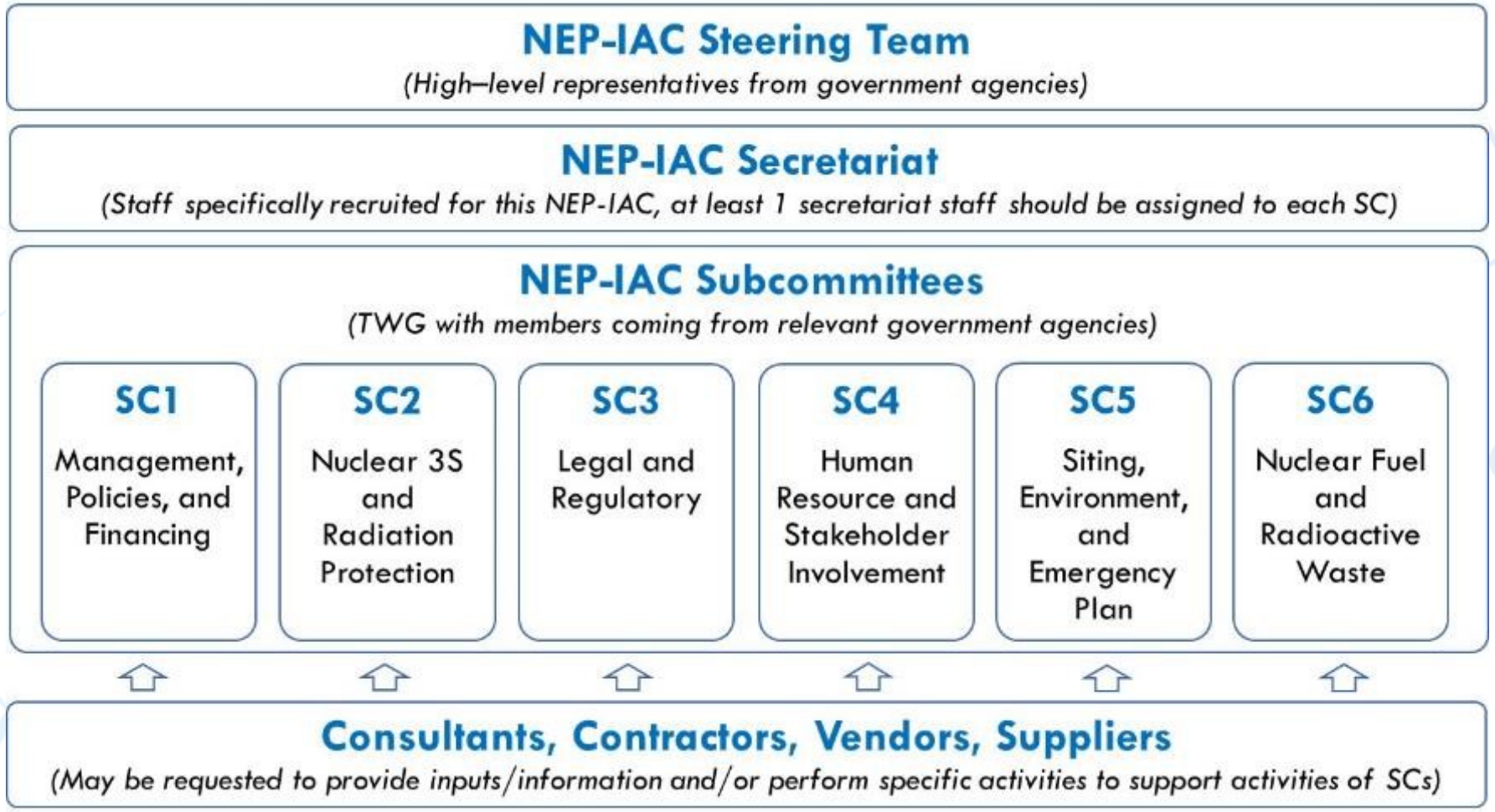
- Department of Energy (DOE)
- Department of Science and Technology (DOST)
- Department of Environment and Natural Resources (DENR)
- Department of Interior and Local Government (DILG)
- Department of Finance (DOF)
- Department of Foreign Affairs (DFA)
- National Economic and Development Authority (NEDA)
- National Power Corporation (NPC)
- National Transmission Corporation (Transco)
- Philippine Nuclear Research Institute (PNRI)
- Philippine Institute of Volcanology and Seismology (PHIVOLCS)

Additional Members that were invited citing Section 5 (Convergence) of the EO:

- Department of Justice (DOJ)
- Department of Trade and Industry (DTI)
- Department of National Defense (DND)
- Presidential Communications Operations Office (PCOO)
- Commission on Higher Education (CHED)
- Technical Education and Skills Development Authority (TESDA)
- Department of Health (DOH)

EO116 - NEP-IAC

Executive order 116: Creation of the Nuclear Energy Program Inter-Agency Committee (NEP-IAC)



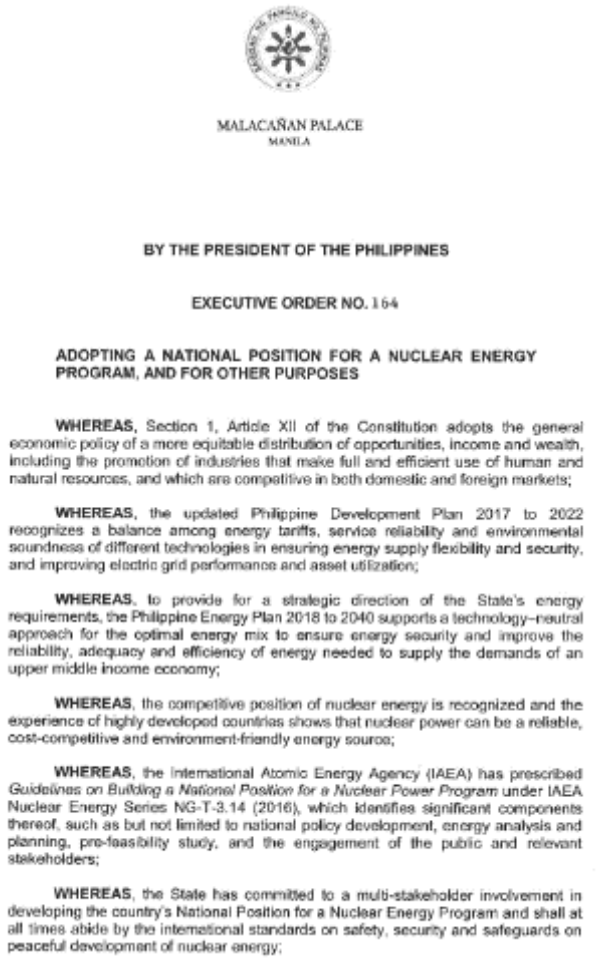
EO 116 - NEP-IAC

Executive order 116: Creation of the Nuclear Energy Program Inter-Agency Committee (NEP-IAC)

Subcommittees	Composition	19 Infrastructure scope *
SC1: Management, Policies, and Financing	**DOE**, DOST, NEDA, DOF, DFA, NPC, TransCo	1. National Position 3. Management 4. Funding and Financing 9. Electrical Grid 19. Procurement
SC2: Nuclear Safety, Security, Safeguards, and Radiation Protection	DOE, DOST, **PNRI**, DILG, DFA, DND	2. Nuclear Safety 6. Safeguards 8. Radiation Protection 15. Nuclear Security
SC3: Legal and Regulatory	**DOE**, DOST, PNRI, DOJ	5. Legal Framework 7. Regulatory Framework
SC4: Human Resource and Stakeholder Involvement	DOE, **DOST**, PNRI, CHED, TESDA	10. Human Resource Development 11. Stakeholder Involvement 18. Industrial Involvement
SC5: Siting, Environment and Emergency Plan	**DOE**, DOST, PNRI, PHIVOLCS, DILG, DENR	12. Site and Supporting Facilities 13. Environmental Protection 14. Emergency Planning
SC6: Nuclear Fuel and Radioactive Waste	DOE, DOST, **PNRI**, DENR, PHIVOLCS, DFA	16. Nuclear Fuel Cycle 17. Radioactive Waste Management

EO 164

Executive order 164: Adopting a National Position for a Nuclear Energy Program



MALACAÑAN PALACE
MANILA

BY THE PRESIDENT OF THE PHILIPPINES

EXECUTIVE ORDER NO. 164

ADOPTING A NATIONAL POSITION FOR A NUCLEAR ENERGY PROGRAM, AND FOR OTHER PURPOSES

WHEREAS, Section 1, Article XII of the Constitution adopts the general economic policy of a more equitable distribution of opportunities, income and wealth, including the promotion of industries that make full and efficient use of human and natural resources, and which are competitive in both domestic and foreign markets;

WHEREAS, the updated Philippine Development Plan 2017 to 2022 recognizes a balance among energy tariffs, service reliability and environmental soundness of different technologies in ensuring energy supply flexibility and security, and improving electric grid performance and asset utilization;

WHEREAS, to provide for a strategic direction of the State's energy requirements, the Philippine Energy Plan 2018 to 2040 supports a technology-neutral approach for the optimal energy mix to ensure energy security and improve the reliability, adequacy and efficiency of energy needed to supply the demands of an upper middle income economy;

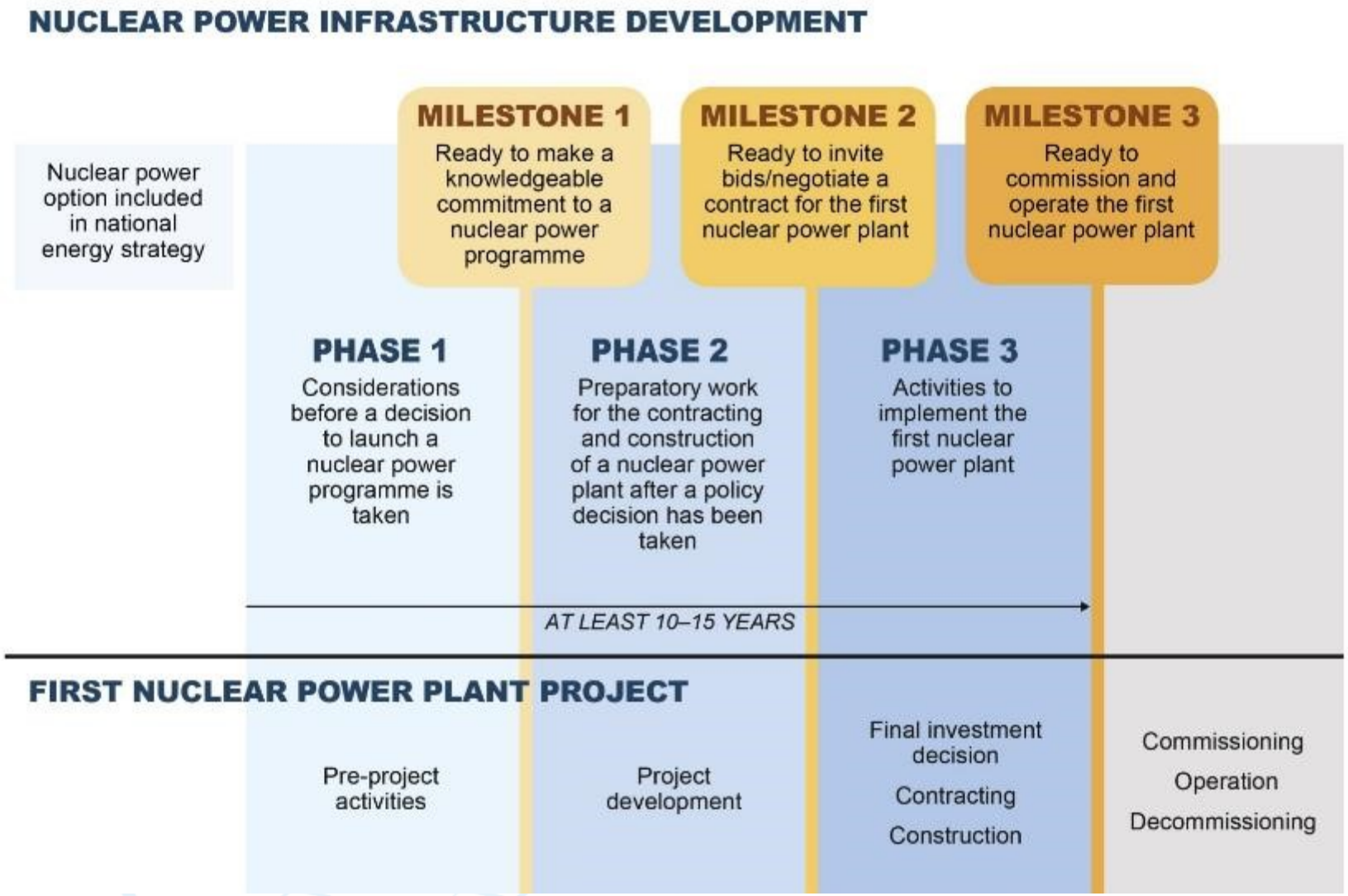
WHEREAS, the competitive position of nuclear energy is recognized and the experience of highly developed countries shows that nuclear power can be a reliable, cost-competitive and environment-friendly energy source;

WHEREAS, the International Atomic Energy Agency (IAEA) has prescribed *Guidelines on Building a National Position for a Nuclear Power Program* under IAEA Nuclear Energy Series NG-T-3.14 (2016), which identifies significant components thereof, such as but not limited to national policy development, energy analysis and planning, pre-feasibility study, and the engagement of the public and relevant stakeholders;

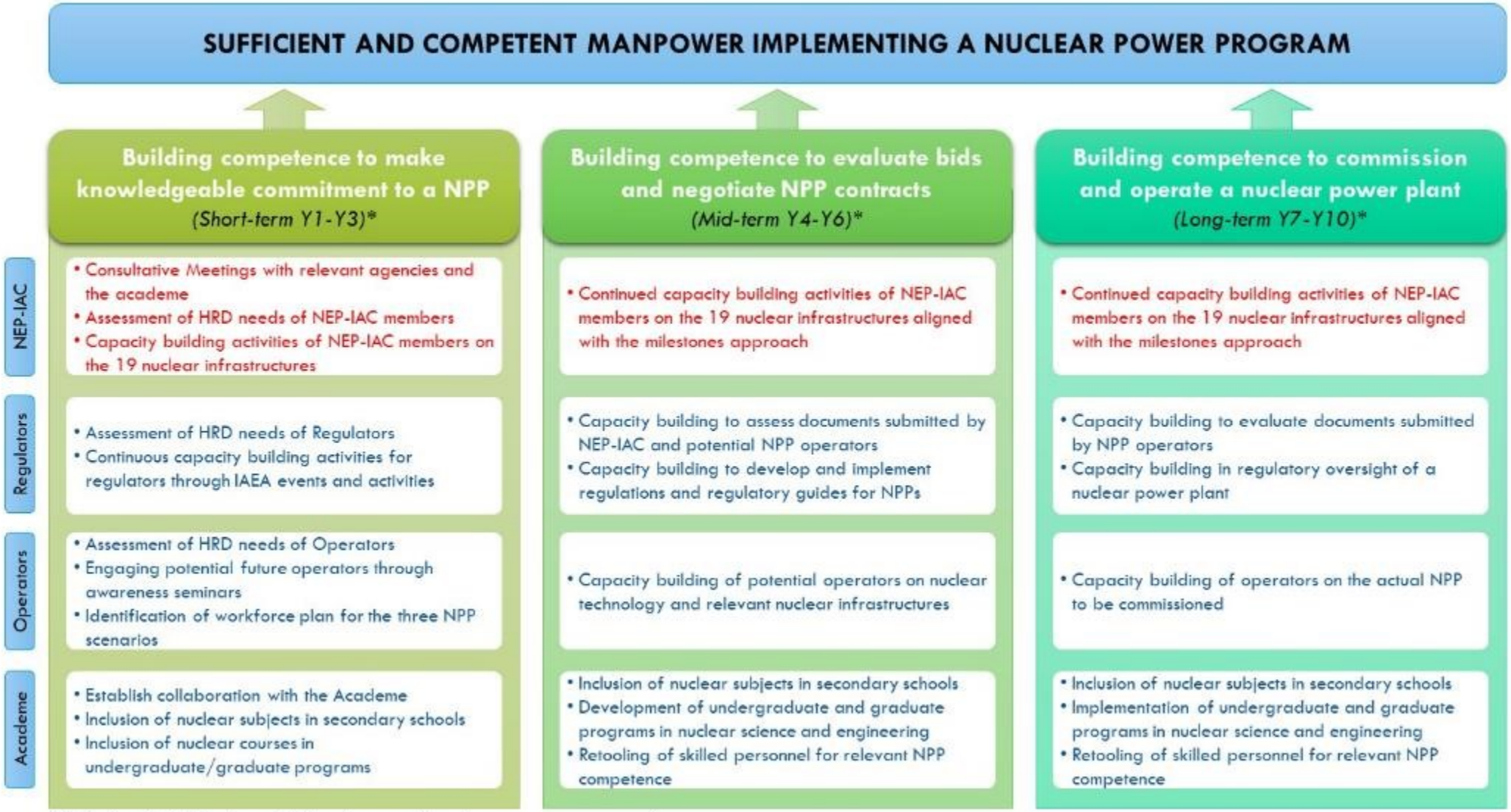
WHEREAS, the State has committed to a multi-stakeholder involvement in developing the country's National Position for a Nuclear Energy Program and shall at all times abide by the international standards on safety, security and safeguards on peaceful development of nuclear energy;

- Legal and regulatory framework
- National strategy for nuclear program
- Development of 19 nuclear infrastructure
- Implement strategic communication
- Implement IWP with IAEA assistance

IAEA Milestone Approach

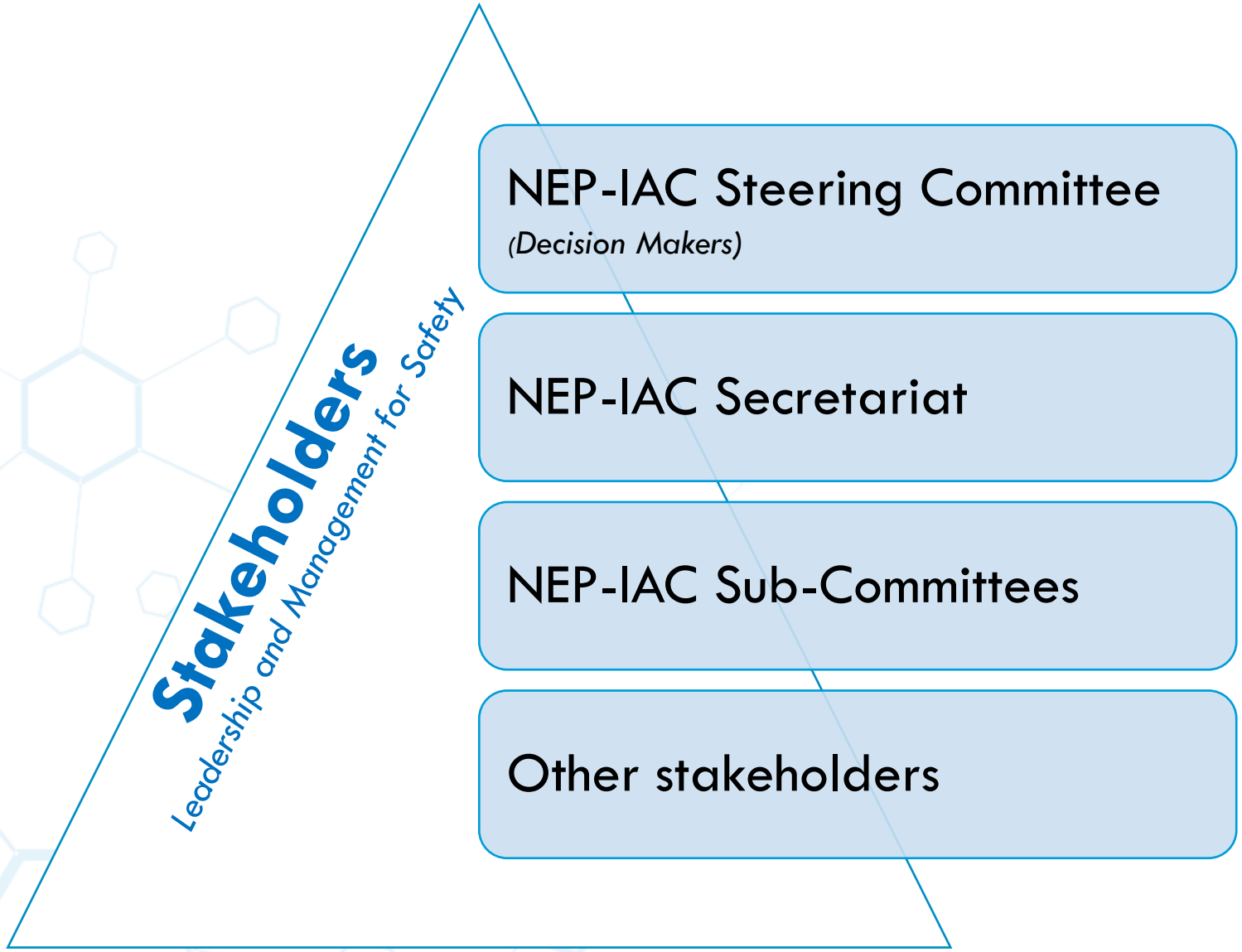


NEP-IAC proposed nuclear HRD Program



Indicative. Actual timeline will follow the over-all nuclear power program roadmap.

Stakeholders for Leadership and Management for Safety



- NEP-IAC Steering Committee
  (Decision Makers)
- NEP-IAC Secretariat
- NEP-IAC Sub-Committees
- Other stakeholders

Activities with NEP-IAC Stakeholders

SUFFICIENT AND COMPETENT MANPOWER IMPLEMENTING A NUCLEAR POWER PROGRAM

Activities with NEP-IAC stakeholders

	Short-Term *(Y1-Y3)*	**Mid-Term** *(Y4-Y6)*	**Long-Term** *(Y7-Y10)*
Objective	• Consultative Meetings with relevant agencies and the academe • Assessment of HRD needs of NEP-IAC members • Capacity building activities of NEP-IAC members on the 19 nuclear infrastructures	• Continued capacity building activities of NEP-IAC members on the 19 nuclear infrastructures aligned with the milestones approach	• Continued capacity building activities of NEP-IAC members on the 19 nuclear infrastructures aligned with the milestones approach
Decision makers	• High-level consultative meetings and agreements; Orientation/Briefings on Treaties and Conventions; facility exposure; scientific visits; Assessment of HRD needs of NEPIAC Members		
NEP-IAC Secretariat	• Awareness activities • Familiarization of nuclear terminologies • Capacity building to develop NST coordination/communication skills	• Awareness activities • Continued familiarization of nuclear terminologies • Continued NST communication /coordination skills	• Awareness activities • Continued familiarization of nuclear terminologies • Continued NST communication /coordination skills
NEP-IAC Subcommittees	• Capacity building activities of NEPIAC Members on the 19 nuclear infrastructures (fellowships, SVs, facility exposures, etc.)	• Continued capacity building of NEPIAC Members on the 19 nuclear infrastructures	• Continued capacity building of NEPIAC Members on the 19 nuclear infrastructures
Other stakeholders	• Awareness activities, consultancy meetings, etc. depending on their their research	• Continued awareness activities	• Continued awareness activities

PNRI Nuclear Education Initiatives

Existing

- Internet Reactor Laboratory
- FTC Reactor Engineering
- Reactor Training Program
- Non-Destructive Testing (NDT) Courses

Proposed/Planned

- Proposed Nuclear Power Training Program
- Basic Regulators' Training Course

Thank you!

Department of Science and Technology
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