



**CODE OF CONDUCT
ON THE SAFETY
OF RESEARCH REACTOR**

Thailand Institute of Nuclear Technology
Bangkok, THAILAND

Anantachai PECHRAK

Content

- *History*
- *Status of Implementation of the Code of Conduct of Thailand Institute of Nuclear Technology (TINT)*
 - *Management of Safety*
 - *Assessment and Verification of Safety*
 - *Financial and Qualified Human Resources*
 - *QA Programmes*
 - *Human Factors*
 - *Radiation Protection*
 - *Emergency Preparedness*
 - *Siting*
 - *Design, construction and commissioning*
 - *Operation, Maintenance, Modification and Utilization*
 - *Extended Shutdown*
 - *Decommissioning*

History

- **1961** Establishment of Office of Atoms for Peace
- **1962** First Critical of TRR-1
- **1975** Modified the Reactor Core to TRIGA Mark III
- **1977** First critical with TRIGA Core, TRR-1/M1
- **2003** Reorganization, Separate Operation and Regulatory body.
- **2006** Establishment of Thailand Institute of Nuclear Technology



REACTOR BUILDING

Organization structure

- Since 2003, OAP has been reorganized and separated the regulatory body from the operation part, so call “Bureau” and “Program”
- 2006 Establishment TINT and separated the operation part (Programs) to TINT

Ministry of Science and Technology

Thai Atomic Energy Commission for Peace

14 Sub – committees

Office of Atoms for Peace

Institute of Nuclear Technology (TINT)

Office of the Secretary

Bureau of Atomic Energy Administration

Bureau of Radiation Safety Regulation

Bureau of Nuclear Safety Regulation

Bureau of Technical Support for Safety Regulation

Radioactive Waste Management Program

Radioisotope Production Program

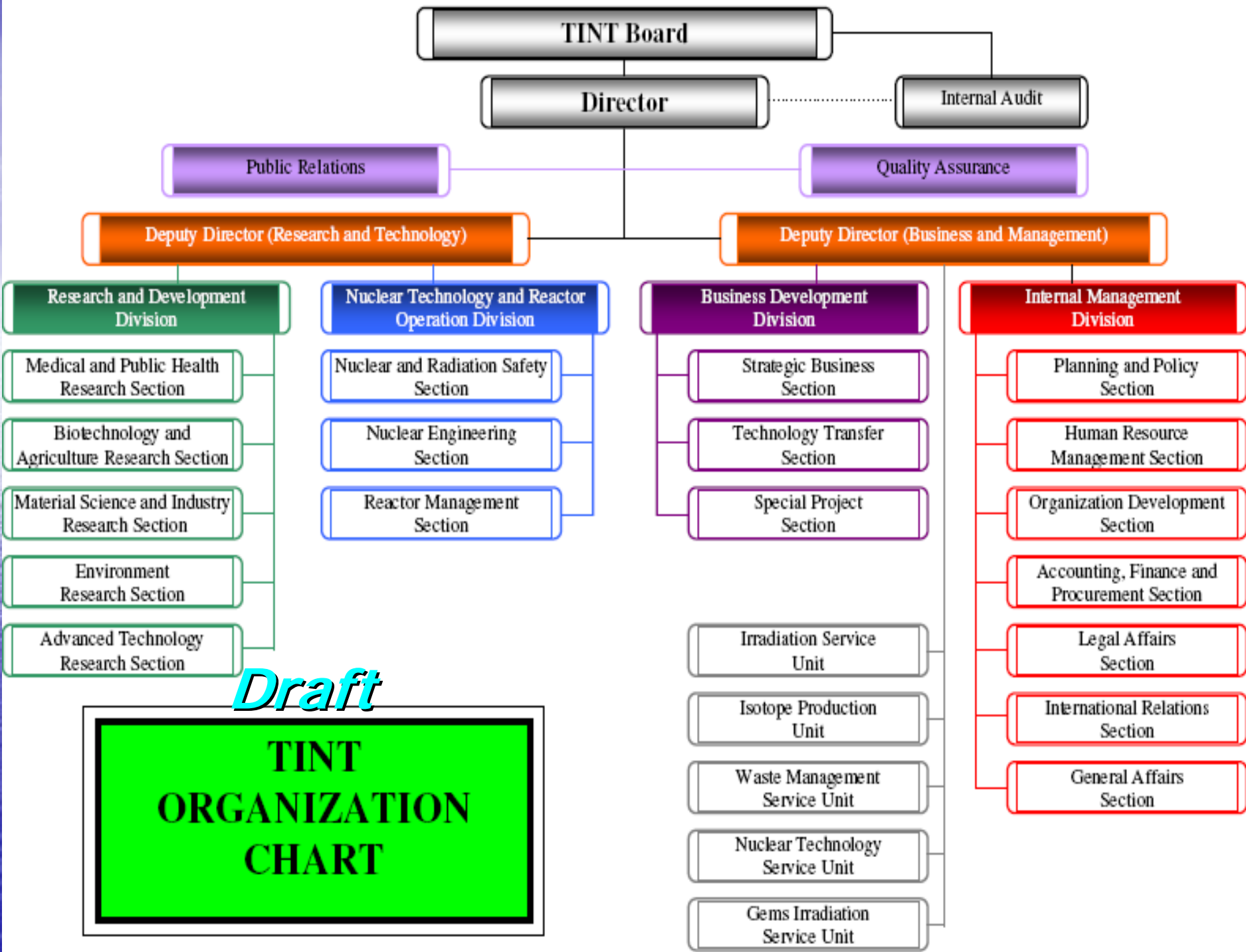
Research Reactor and Nuclear Technology Operation Program

Radiation and Nuclear Safety Program

Irradiation for Agriculture Research Program

Chemistry and Material Science Research Program

Physics and Advanced Technology Research Program



Draft

TINT ORGANIZATION CHART

Management of Safety

- Establishment TINT policies.
- Defined divisions of responsibility
- Lines communication

Assessment and Verification of Safety

- Assessment of safety : Assess by nuclear and radiation safety group, reactor operation group and technical supporting group.
- Safety reviews : Review by technical supporting group and nuclear and radiation safety group
- Update SAR : Update by technical supporting group and nuclear and radiation safety group

Financial and Qualified Human Resources

- Defined the numbers and qualified of staff
- Assign for the education and training for staff

Human Resource

- **Reactor Supervisor = 2**
 - Graduated in Engineering Field
 - Passed the Reactor Operator Training
 - At least 10 years working on the Research Reactor Operation
- **Reactor Senior Operator = 3**
 - Graduated in Engineering Field or Technical School
 - Passed the Reactor Operator Training
 - At least 10 years working on the Research Reactor Operation

Human Resource (cont'd..)

- **Reactor Operator = 7**
 - Graduated in Engineering Field or Technical School
 - Passed the Reactor Operator Training
- **Reactor Trainee = 7**
 - Graduated in Engineering ,Science or Technical School
 - Work for the Reactor Operation Group or Bureau which his/her work is related to the Safety of Research Reactor.

Human Resource (cont'd.)

- Health Physicists = 4
 - Graduated in Engineering Field, Science or Technical School
 - Passed the Reactor Health Physicist Training
- * On the present time, Health Physicist works are under responsibility of **Nuclear and Radiation Safety Section**

Training

- In order to gain up the knowledge of staff, not only the Reactor Operator training has been provided, but also the other training are arranged as listed below
 - Radiation Protection Level 1 (3 times/year)
 - Radiation Protection Level 2 (3 times/year)
 - Radiation Protection for Supervisor (1 time/year)
 - Emergency Preparedness (1 time/year) with (practice)
 - Refreshment of Reactor Operator Training

QA Programmes

- IAEA and operating organization was establish QA program
- In the processing : Setting up by technical supporting and reactor operation group for

Human Factors

- Standard of Operation Procedure
 - Reactor Operation
 - Reactor Experimental
 - Reactor maintenance
- Training and Refreshment for Operator
- Emergency Plan

Radiation Protection

Responsibility

- Controlled Area
 - Provide the equipments
 - Workplace monitoring
 - External dose Record to the worker

Controlled Area concerning occupational exposure

- The area which classified to be the control area : the dose exceeds $1/3$ of annual dose
- Access to the area is normally limited
- Entry by other person must be authorized by the officer in charge of the Reactor Area.
- Every person entering this area is provided with a personal dosimeter and appropriate clothes and plastic cover shoes.

Equipment for controlling occupational exposure



Survey meter



Pocket dosimeters



Alarming dose rate meter and Continuous air monitor



Hand and Foot contamination monitor



Portable Contamination survey meter

Workplace monitoring for controlling exposure to the worker

- **3 area monitors for detecting the radiation dose rate.**
 - **a Continuous Air Monitor for checking the airborne contamination**
 - **a coolant monitor for monitoring the radiation level.**
 - **conduct the radiation and contamination survey**

External dose to the worker

- Providing the personal dosimeter to the worker and keep the dose record
- effective external dose equivalent will be evaluated every 3 months
- Type of Personal Dosimeter
 - TLD, Film badge, Pocket dosimeter
 - Report in term of Deep Dose

External dose to the Public

- measure the radioactive gas Ar-41 in the reactor area
- Ar-41 concentration in the Gas Tight Area, Reactor Building exhaust air is 2×10^{-2} Bq/m³
- Annual radioactive gas release 5×10^{11} Bq/year
(OAP Limit 5×10^{12} Bq/year)

Emergency Preparedness

- Set out in the Radiation Safety Manual in accordance with
 - the responsibilities of personnel
 - radiation safety for dose control
 - operational safety
 - fire safety and an emergency procedure
- the radiological emergency plan in working place
- exercised on plan for the reactor perform once a year since 2003

Siting

- The reactor is currently in operation. The siting studies is currently being re-evaluated as part of the revision of the Safety Analysis Report.

Design, construction and commissioning

- The reactor has been in operation since 1962. No design re-evaluation has been performed.
- The reactor was constructed and in operation since 1962.
- The reactor was commissioning in 1962.

Operation, Maintenance, Modification and Utilization

- Establish and revise OLCs
- Establish SOP
- Keep the report of significant events
- Modification for RR was approve by RSC and regulatory body

Conduct of Operations

- Reactor Specification
 - TRR-1/M1 TRIGA Mark III Core
 - Cylindrical Shape
 - Fuel : UZrH 1.6
 - Maximum Power 2 MW
 - Rated Power 1.2 MW (Present status)

Purpose of Operation

- Radio Isotope Production (Medical Isotope : I - 131)
- Neutron Activation Analysis (NAA)
- Gemstones Colorization
- Neutron Radiography
- PGNAA
- Training of Research Reactor Operator

Operation Schedule

- 46 Hours a week : 4 Days
- 8 Hours per shift (Startup in Morning and shutdown in evening)
- Monday : Reserve for Weekly Maintenance
- Tuesday – Thursday : 12 Hours operation (2 shift)
- Friday : 10 Hours Operation and Irradiated Samples removal (2 shift)
- Each shift comprised of
 - 1 Reactor Shift Supervisor
 - 2 Reactor Shift Operators
 - 1 Reactor Technician
 - 1 Health Physicist

Reactor Operation Group

- In charge of manage the manpower for Weekly operation schedule
- Reactor Utilization Assistance including the approval of any samples which will be loaded in the reactor
- Operate the reactor in accordance with the operation plan and estimate the life time of reactor core management
- Manipulated the Weekly and Yearly Maintenance plan and unplanned maintenance (if any)

Reactor Operation Group

- Evaluate the safety or any effect that could arise the risk to the nearby facilities
- Issue the suit procedure for
 - Reactor Startup Procedure
 - Reactor Operation Procedure including the changing of reactor power
 - Reactor Shutdown
 - Unplanned or Emergency Shutdown Procedure
- Prepare the Decommissioning plan for the current Research Reactor

Extended Shutdown

- At present, the programme for extended shutdown is studying for prepare the plan for extended shutdown.

Decommissioning Plan

- Propose the objective option to the Government
 - Storage with Surveillance
 - Restricted Site Use
 - Unrestricted Site Use
- Contact the related organization and discuss the detail of plan

Related Organization

- Nuclear Technology and Reactor Operation Division
- Radioactive Waste Management Service Unit
- Bureau of Radiation Safety Regulation
- Bureau of Nuclear Safety Regulation

Estimated time table for Decommissioning

- The work planned for the decommissioning are estimated for 10 years, since the plan has been approved to the completely clear the reactor site area



Thank You

www.tint.or.th