Regional Workshop on Safety of Research Reactors
"Decommissioning Activities: Project Planning, Management, Regulatory Review and Safety Assessment" Manila, PHILIPPINES, 15 – 19 September 2008

THE PREPARATION FOR THE DECOMMISSIONING PLAN OF THE DALAT NUCLEAR RESEARCH REACTOR

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Brief Introduction to DNRR (1/5)

History of the DNRR:

26/2/1963: Former TRIGA Mark II reached its first criticality

4/3/1963: The reactor was officially inaugurated with the nominal power of 250 kW

1963-1968: The reactor had been operated with the 3 main purposes: training, research, and radioisotope production

1968-1975: The TRIGA reactor was in extended shutdown

1974-1975: Fuels were unloaded and shipped back to USA

15/3/1982: The reconstruction and upgrading work of the DNRR was started under the contract No. 85/096-54100 with Russian designer.

1/11/1983: The DNRR reached its first criticality

20/3/1984: the DNRR was officially inaugurated with the nominal power of 500 kW.

3/1984-now: Reactor has been operated steady.

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Brief Introduction to DNRR (2/5)

DNRR Characteristics:

Reactor type: Pool type
Nominal thermal power: 500 kW
Maximum thermal neutron flux in the core: 2.1×10^{13} $n.cm^{-2}.s^{-1}$
Coolant and moderator: Light water
Core cooling mechanism: Natural convection
Reflector: Beryllium and Graphite
Fuel type: VVR-M2, U-Al alloy, 36% enrichment and UO_2+Al, 19.75% enrichment
Number of control rods: 7 (2 safety rods, 4 shim rods, 1 regulating rod)

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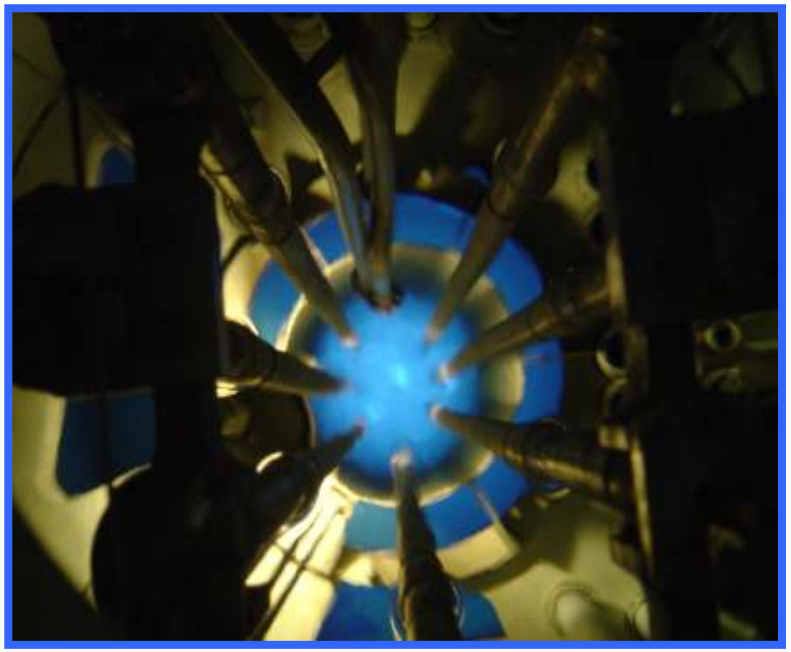
Brief Introduction to DNRR (3/5)



DNRR Characteristics:

Vertical irradiation channels: 4 (neutron trap, 1 wet channel, 2 dry channels) and 40 holes at the rotary specimen rack

Horizontal beam-ports: 4 (1 tangential, 3 radial)

Thermal column: 1

Spent fuel storage pool (temporary): inside reactor building, next to the reactor tank

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Brief Introduction to DNRR (4/5)

The control room of the DNRR

Operating Cycle and Results:

Operating cycle: Continuous operation for 108 hrs at full power and then shut down for 3 weeks to carry out maintenance work (sometimes short-run).

Accumulative thermal energy (burn up): ~635 MWd

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Brief Introduction to DNRR (5/5)

I-131 Production Line

Radioisotopes and Pharmaceuticals Produced at DNRI

Utilization of the DNRR:

- ✓ *Radioisotope Production*
- ✓ *Neutron Activation Analysis*
- ✓ *Basic and applied research in nuclear physics*
- ✓ *Personnel training and education*

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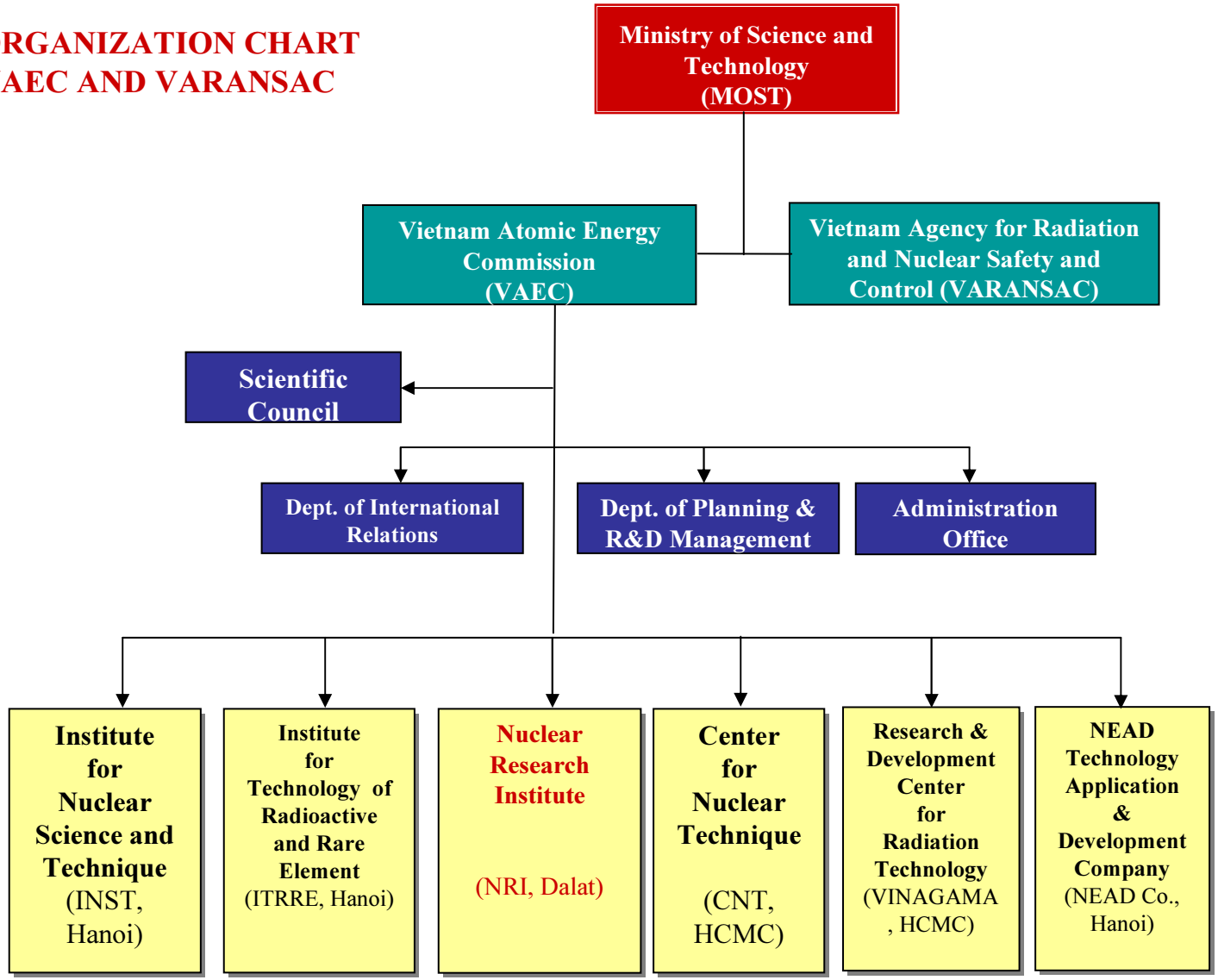
Legal/Regulatory Framework on Decommissioning in Vietnam (1/7)

THE ORGANIZATION CHART OF VAEC AND VARANSAC



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Legal/Regulatory Framework on Decommissioning in Vietnam (2/7)

The functions, duties and authorities of the regulatory thority (VARANSAC) are as follows:

1. The regulatory authority's function is to assist the Minister of Science and Technology in State management of radiation and nuclear safety.
2. The regulatory authority shall have the following duties and authorities:
   - *To develope and submit legal documents on radiation and nuclear safety to relevant authorities for promulgation and to implement those legal documents;*
   - *To register and license radiation and nuclear activities in accordance with the Law;*

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Legal/Regulatory Framework on Decommissioning in Vietnam (3/7)

- *To conduct assessment on radiation and nuclear safety in accordance with the law;*
- *To carry out inspection, check and to handle violations against regulations on radiation and nuclear safety as prescribed in the law;*
- *To organise for international safeguards related activities within its competency;*
- *To carrying out international cooperation activities in radiation and nuclear safety;*
- *To take part in emergency response to radiation and nuclear incidents within its competency;*
- *To perform other functions and authorities as prescribed by law.*

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Legal/Regulatory Framework on Decommissioning in Vietnam (4/7)

Besides Regulatory Authority, according to the National Atomic Energy Law, the **National Nuclear Safety Council**, established by Prime Minister, shall have the following functions and duties:

- To provide advice to the Prime Minister on policies and measures to ensure nuclear safety for atomic energy utilisation;

- To review and assess verification reports of Regulatory Authority on the safety of a nuclear power plant to provide advice for issuance of operation licenses; to ensure safe operation of nuclear power plants; to request to stop or shut down operation if safety requirements are not complied;

- To review and evaluate nuclear safety level of other nuclear facilities to advise Prime Minister in decision making when needed.

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Legal/Regulatory Framework on Decommissioning in Vietnam (5/7)

- A National Atomic Energy Law, which covers provisions for decommissioning, was ratified by Vietnam National Assembly on 3 June 2008.

- According to the National Atomic Energy Law:

  - ***Article 43*** *states that:*

    + *a safety assessment report for construction of a nuclear facility shall include a proposed plan for operation termination and decommissioning.*

    + *a safety assessment report for operation termination shall include decommissioning and decontamination procedures.*

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Legal/Regulatory Framework on Decommissioning in Vietnam (6/7)

*- **Article 45** assigns responsibilities for organizations (MOST, Regulatory Authority (RA), Operating Organizations (OO)) in relation to decommissioning and decontamination of a nuclear facility.*

1. Once a nuclear facility has been closed down, the OO shall apply to the regulatory authority for approval of the plan for decommission, decontamination, radioactive waste and nuclear fuel management, and shall carry out the approved plan.

2. The RA shall examine the decommissioning, decontamination, radioactive waste management process and shall issue a decision to acknowledge that the nuclear facility is no longer responsible for safety.

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Legal/Regulatory Framework on Decommissioning in Vietnam (7/7)

*- **Article 45** (con't)*

3. The organization possessing the nuclear facility shall bear all the cost associated with decommissioning and management of wastes released from the decommissioning process.

4. The MOST shall issue requirements for safety and environment protection in decommissioning; procedures of application for, assessment of and approval of the decommissioning, decontamination, radioactive waste management and nuclear fuel management plan of nuclear facilities.

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Preparation for the Decommissioning Plan of the DNRR (1/5)

Decommissioning plan of the DNRR:

- There has not been a decommissioning plan for the DNRR yet.
- A decommissioning plan for the DNRR in operation stage will be prepared by NRI staff under the 2 year ministerial project, starting from January 2009 to December 2010.

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Preparation for the Decommissioning Plan of the DNRR (2/5)

The contents of the ministerial project for preparing the decommissioning plan of the DNRR:

1. Radionuclide inventory assessment and characterization:
   - *calculating the neutron distribution within structures, systems and equipment of the reactor (such as beryllium and graphite reflectors, alluminium tank, concrete structure…) using MCNP computer code*
   - *determining the activation activity of radionuclides (maximum and average levels) present in the structures, systems and equipment of the reactor based on the reactor operating history and using ORIGEN2 computer code*
   - *carrying out the sampling when necessary*
2. Development of the decommissioning plan for the DNRR based on the IAEA guidance (Safety Reports Series No.45)

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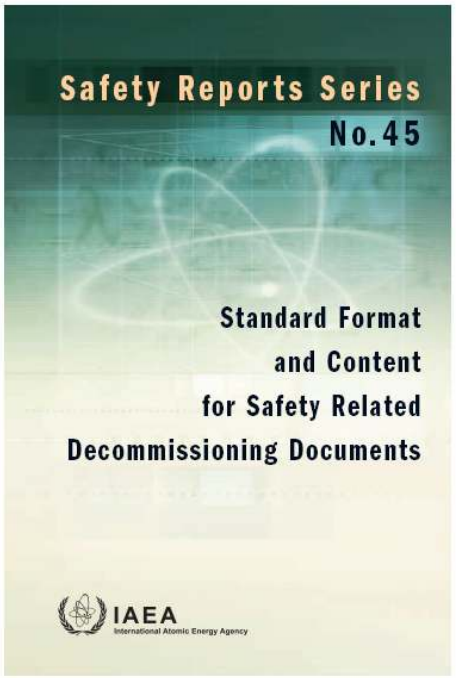
Preparation for the Decommissioning Plan of the DNRR (3/5)



The major topics of the decommissioning plan:

1. Introduction to the name and address of the reactor and licensee's name and address.
2. Facility description, including:
   - *site location and description,*
   - *building and system description,*
   - *current radiological status, and*
   - *facility operating history*
3. Decommissioning strategy:
   - *alternatives considered (immediate decommissioning or deferred dismantling or entombment)*
   - *rationale for chosen strategy*

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Preparation for the Decommissioning Plan of the DNRR (4/5)

The major topics of the decommissioning plan (con't):

4. Project management:
   - *legal and regulatory requirements*
   - *project management organization and responsibilities*
   - *Task management organization and responsibilities*
   - *Safety culture*
   - *Training*
   - *Schedules*
5. Proposed decommissioning activities (contaminated structures, contaminated systems and equipment, soil, surface and groundwater)
6. Waste management (solid radioactive waste, liquid radioactive waste, and waste containing both radionuclides and other hazardous material)

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Preparation for the Decommissioning Plan of the DNRR (5/5)

The major topics of the decommissioning plan (con't):

7. Cost estimate and funding mechanisms
8. Safety assessment
9. Environmental assessment (background data, environmental protection programme, effluent monitoring programme, effluent control programme)
10. Health and safety (Radiation protection programme, nuclear criticality safety, dose estimation and optimization for major task, clearance criteria, etc…)
11. Quality assurance
12. Emergency planning
13. Physical security and safeguards

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Summary

- A National Atomic Energy Law was ratified by Vietnam National Assembly in June 2008. The provisions for decommissioning was covered by the Law.
- The ongoing decommissioning plan of the DNRR are being prepared by the operator within the national project.

Thank you
For your attention!