



Challenges in maintaining nuclear capabilities of TSOs in a delayed projects environment

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ROMANIAN NUCLEAR RESEARCH HISTORY (1)

- ✓ **1949:** first Romanian nuclear research entity **Institute for Atomic Physics (IFA)** Magurele was founded.
- ✓ **1955:** after the first Geneva International Conference on the Peaceful Uses of Atomic Energy, the **Committee for Nuclear Energy** was set up.
- ✓ **1957:** first nuclear research reactor imported from former Soviet Union was commissioned in IFA Magurele.
- ✓ In the same year, Romania became the foundation member of the International Agency for Atomic Energy (IAEA) Vienna.
- ✓ **1970:** as a consequence of the decision to develop the Romanian Nuclear Power program, the **Institute for Nuclear Technology (ITN) Pitesti** was created.



ROMANIAN NUCLEAR RESEARCH HISTORY (2)

- ✓ **1970:** National Research and Development Institute for Cryogenics and Isotopic Technologies - ICSI Valcea was created mainly for the research in field of the heavy water production in Romania.
- ✓ **1977:** Restructuring process of the nuclear research field in Romania:
 - IFA Magurele became **ICEFIZ** (including all the nuclear research entities from Bucharest Magurele, Pitesti, Cluj and Iasi).
 - Institute for Nuclear Technology (ITN) Pitesti became **Institute for Nuclear Power Reactors (IRNE)**.
- ✓ **1979:** The second nuclear research reactor (TRIGA type) was commissioned in IRNE Pitesti.



ROMANIAN NUCLEAR RESEARCH HISTORY (3)

National nuclear research entities operating now in Romania:

- ✓ Horia Hulubei National Institute of Research and Development in Physics and Nuclear Engineering (IFIN-HH) Magurele.
- ✓ Institute for Nuclear Research (ICN) Pitesti part of the Nuclear Energy Technologies Authority (RATEN).
- ✓ National Research and Development Institute for Cryogenics and Isotopic Technologies - ICSI Valcea.



CONTRIBUTION OF NUCLEAR RESEARCH (1)

- Main activities performed in this preparatory stage (equivalent with **Phase 1** of the IAEA milestone approach), under the coordination of the Committee for Nuclear Energy:
 - ✓ Studies for the introduction of the Nuclear Power in the national energy strategy (advantages, benefits, issues, consequences).
 - ✓ Research on the required legislative and regulatory frameworks used in the developed countries with Nuclear Power programs.
 - ✓ Definition of the required national Nuclear Infrastructure to be developed and implemented in the country for the introduction of the Nuclear Power program.
- Former Institute for Atomic Physics (IFA) Magurele played an important role in the performance of the above mentioned researches and studies.



CONTRIBUTION OF NUCLEAR RESEARCH (2)

Main activities performed in **Phase 2** under the coordination of the National State Committee for Nuclear Energy (CSEN):

- ✓ Analyses of the NPP technologies available on the market.
- ✓ Establishment of a **national specification for the first NPP** (nuclear safety requirements, nuclear fuel cycle, special qualification, etc.).
- ✓ NPP sites selection and qualification.
- ✓ Implementation of the relevant international legal instruments.
- ✓ Improvement of the existed regulatory framework (specific for the nuclear research reactor).
- ✓ Establishment of a competent and effectively independent Nuclear Safety Regulatory Body (by expanding the existed regulatory body) to license and regulate the design and operation of nuclear facilities.
- ✓ Development and implementation of the specific national programs (safeguards for nuclear materials, radiation protection, environmental protection, etc.).
- ✓ Establishment the policy for national and industrial participation in the nuclear program.
- ✓ Initiation of the program for the development of the required human resources.



CONTRIBUTION OF NUCLEAR RESEARCH (3)

- ✓ Romanian nuclear research institutes (IFA Magurele and the new created ITN Pitesti), under CSEN (NEPIO) coordination, had real contribution to the performance of the Phase 2 above mentioned tasks.
- ✓ Starting with **1971**, a **nuclear engineering group (actual RATEN-CITON)** and future **NPP Owner/Operator (core group)** were created and started to operate in the Ministry of Energy.
- ✓ Good cooperation between these entities/groups (nuclear research institutes, the nuclear engineering group and core group of NPP Owner) in order to solve the specific tasks of Phase 2.



CONTRIBUTION OF NUCLEAR RESEARCH (4)

Main activities performed in **Phase 3:**

- ✓ Specific research for the assimilation in Romania of the production of CANDU 6 nuclear fuel (in IRNE Pitesti) and heavy water (in ICSI Ramnicu Valcea).
- ✓ Preparation of the different testing methodologies for the nuclear equipments and materials in the TRIGA nuclear research reactor (in IRNE Pitesti) and performance of these tests.
- ✓ Fabrication and supply of the different equipment and devices dedicated to Cernavoda Unit 1 (radiation protection and dosimetry laboratory equipment, radiation detectors, airborne and radioactive gases measurement devices, neutrons detectors, etc.).



CONTRIBUTION OF NUCLEAR RESEARCH (5)

Main activities performed in **Phase 3:**

- ✓ Participation in the Cernavoda Unit 1 Project Management Team for the preparation of the commissioning procedures for nuclear island of the plant (especially for CANDU 6 nuclear reactor).
- ✓ Contribution to the revision of the Preliminary and Final Safety Analyses Reports of Cernavoda Unit 1, based on the commissioning results.
- ✓ It should be noted that, in some cases, when a particular nuclear research institute was not involved in performance specific works for Cernavoda Unit 1, it was requested and used as an independent consultant (Technical Support Organization –TSO) of the Regulatory Body.



CONTRIBUTION DURING NPP OPERATION

- ✓ Utilization of the nuclear research entities during the NPP operation is subject of the NPP Owner/Operator management policy and strategy.
- ✓ Existing Romanian nuclear research organizations played the role of Technical Support Organizations (TSO) for the Romanian Nuclear Operator and/or for the Romanian Nuclear Regulatory Body (National Commission for Control of Nuclear Activities – CNCAN).
- ✓ Nuclear research organizations were used as consultant in the technology transfer from the NPP Vendor (specific software for accident analyses, Probabilistic Safety Assessment-PSA tools and specific methods, Plant Life Management-PLIM program, etc.).
- ✓ Research works for the Government or national authorities decisions preparation, like second NPP in Romania, radioactive waste management and final disposal and decommissioning of the nuclear facilities (state budget financing).



PRELIMINARY ASSESMENT OF USER REQUIREMENT UR2

Criteria	Indicators (IN) and Acceptance limits (AL)	Comments
CR2.1: Funding of infrastructure	IN2.1: Funding needed for the infrastructure of a nuclear power programme.	
	AL2.1: Sufficiently available to cover the nuclear power programme.	Danube navigation channel work in progress. Improves cooling capabilities for C3&4
CR2.2: Size of nuclear facility	IN2.2: Size of nuclear installation.	
	AL2.2: Matches local needs.	Exceeds local needs. C3&4 size already decided
CR2.3: Siting	IN2.3: Process of siting a nuclear facility.	
	AL2.3: Siting process has taken safety, security, and environmental requirements into account in accordance with international standards.	C3&4 located on the same site with C1&2 in operation
CR2.4: Support infrastructure	IN2.4: Availability of infrastructure to support owner/operator.	
	AL2.4: Internally or externally available.	Under evaluation. C3&4 completion by BOO contract
CR2.5: Added value	IN2.5: Added value of a nuclear power programme to society.	
	AL2.5: Added value > infrastructure investment by the government necessary to support nuclear power programme.	To be further assessed



Thank you for your attention !

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