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The Status of NPP Projects in Vietnam and the Role of the Center for Nuclear Energy Science and Technology (CNEST)

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Outline

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2) *Nuclear Power Plant (NPP) Projects*

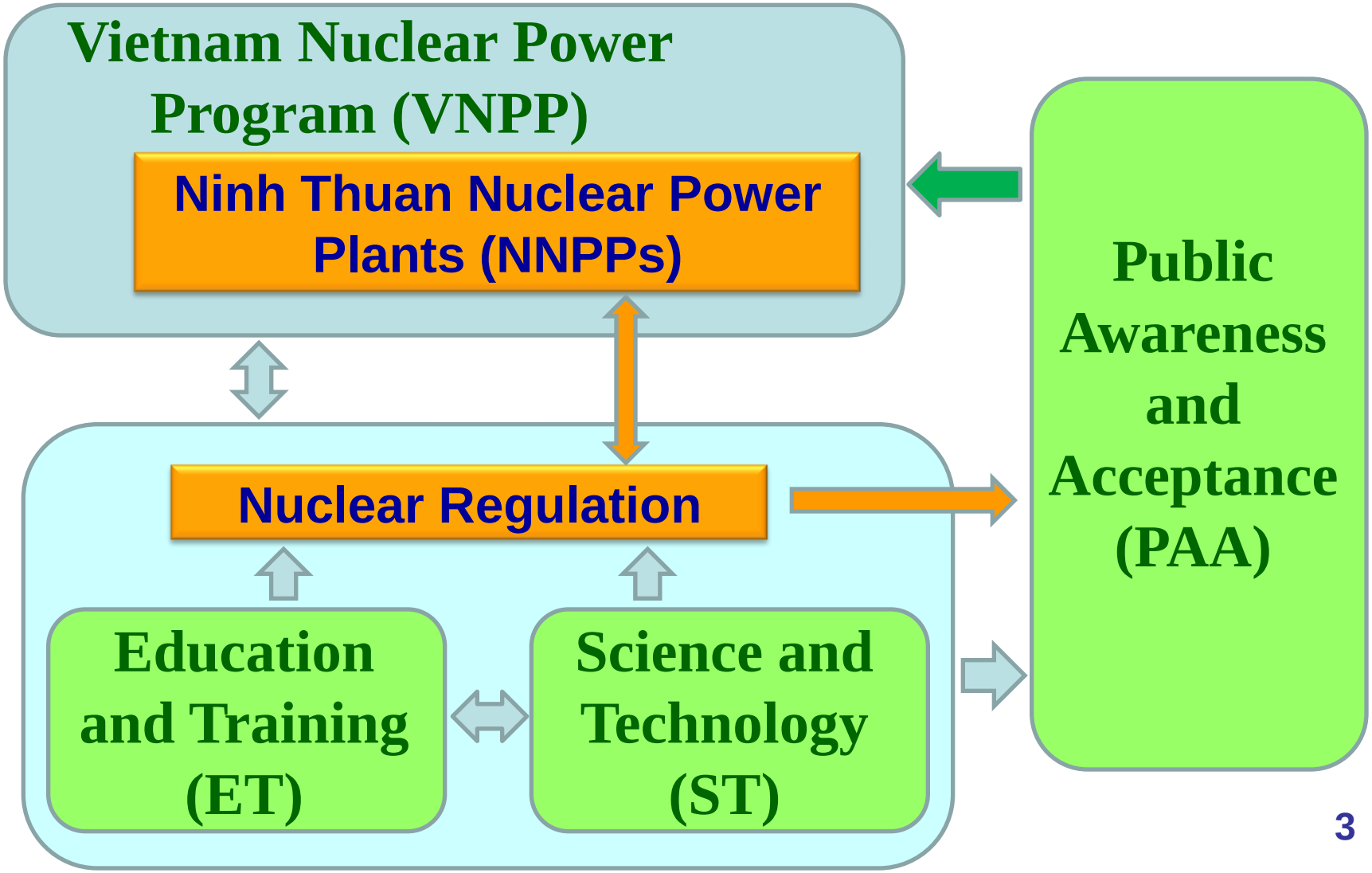
3) *Reactor Safety Research Program*

4) *The Center for Nuclear Energy Science and Technology (CNEST)*

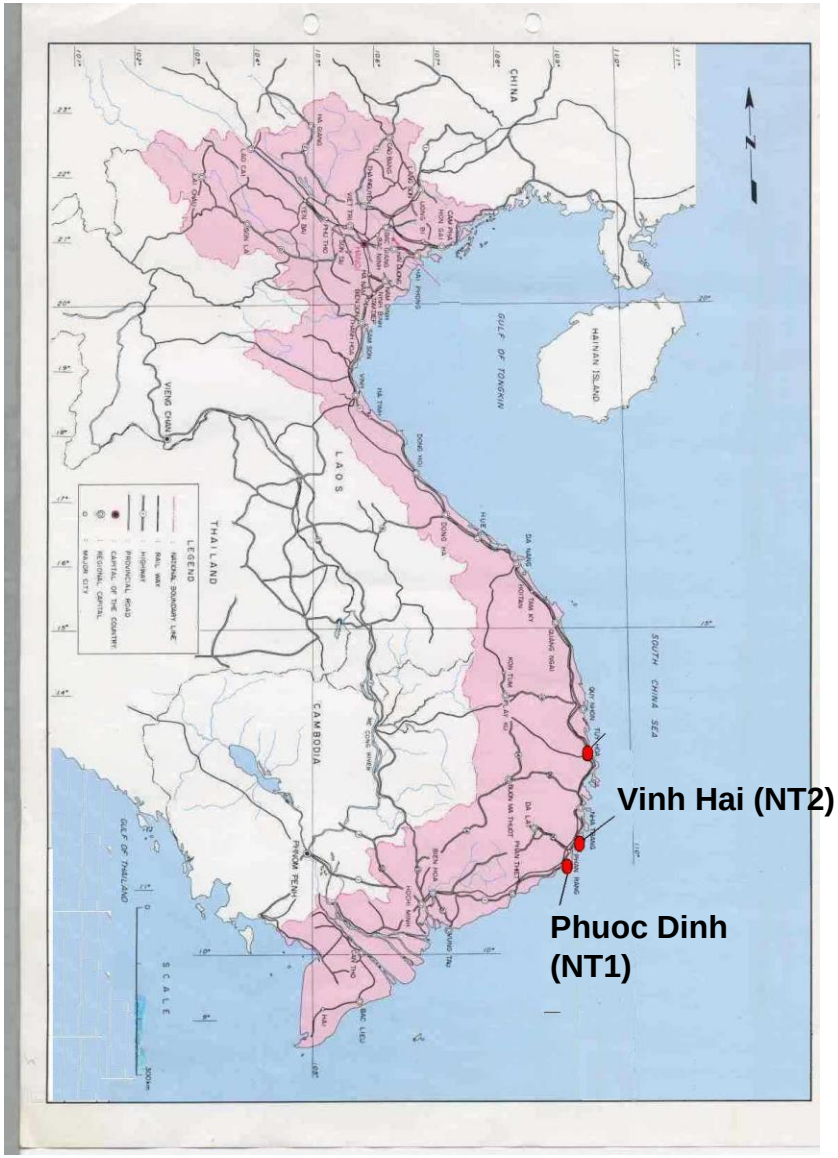
5) *Concluding Remarks*

1. Introduction

Vietnam needs sustainable development of nuclear power



2. Nuclear Power Plant Projects



The First 2 NPP Projects

- ✓ *Pre-FS: 2002-2009*
- ✓ *Ninh Thuan 1 – NT1:*

2x1000 MWe + 2x1000 MWe

(Construction: 2017-2023)

- ✓ *Ninh Thuan 2 – NT2:*

2x1000 MWe + 2x1000 MWe

(Construction: Unclear)

- ✓ *Location:*

300 km from Ho Chi Minh City, 140 km from Dalat

2. Nuclear Power Plant Projects

Feasibility Study (FS) for Ninh Thuan NPP Projects

Ninh Thuan 1:

- ***Consultant:*** *E4 (Moscow EnergoPromTechnology -- EPT and Kiev EnergoProject – KIEP, Ukraine) +* ***AES-Buran***
- *FS start: November 2011*
- *Full FS first submission: December 24, 2013*
- *Technology selection: 5 technologies AES-91, AES-92, AES2006 (V491 and V392M), VVER-TOI*
- *October 2014: Revision ➔ AES2006/V491 (St. Peterburg)*

Feasibility Study (FS) for Ninh Thuan NPP Projects

Ninh Thuan 2:

- ***Consultant:*** *Japan Atomic Power Company (JAPC)*
- *FS start: September 2011*
- *Full FS first submission: May 2013 + Revisions*
- *Technology selection: ABWR, MPWR+, AP1000, ATMEA1*
- *Additional site investigation (JAPC)*

2. Nuclear Power Plant Projects

Next Tasks

Ninh Thuan 1 and Ninh Thuan 2 NPP Projects:

- Completion of FS reports
- Technology selection
- Review of the FS reports and design aspects
- Formulation of technical tasks for the Technical Designs
- Preparation for Contracts
- Licensing (construction and operation)
- Preparation for NPPs construction
- Other tasks

→ **Selection of Consultants for FS and Site Review**

2. Nuclear Power Plant Projects

Near-term (5-10 years) focus: *(in order of priority)*

1) *Develop a core expert group to support high-level nuclear energy R&D policy/decision-making*
   - *Identify weakness/specificity in infrastructure, institutional, human, culture*
   - *Plan items (ii)-(v) below*
2) *Develop capability to enable technical functions that review/oversee/react to actions taken now (0-2 years) that have lasting impact on **Safe, Economical and Sustainable (SES)**;*
3) *Develop capability to enable technical functions that support SES-significant decisions/operations expected in coming 3-5 years*
4) *Develop capability to support licensing, construction, and long-term SES operation*
5) *Develop nuclear energy S&T (quality R&D), and public trust/acceptance* ⇨ **HUMAN RESOURCE DEVELOPMENT**

2. Nuclear Power Plant Projects

*Nuclear power requires **high quality human resources**, not depending on the implementing nation/country is poor or rich*

High quality human resources are key for successful implementing the nuclear power program

3. The Reactor Safety Research Program

Neutron Kinetics
Fluid Dynamics
Thermal Hydraulics
Control & Instrumentation
Materials & Mechanics
Fuel, Chemistry
Transport

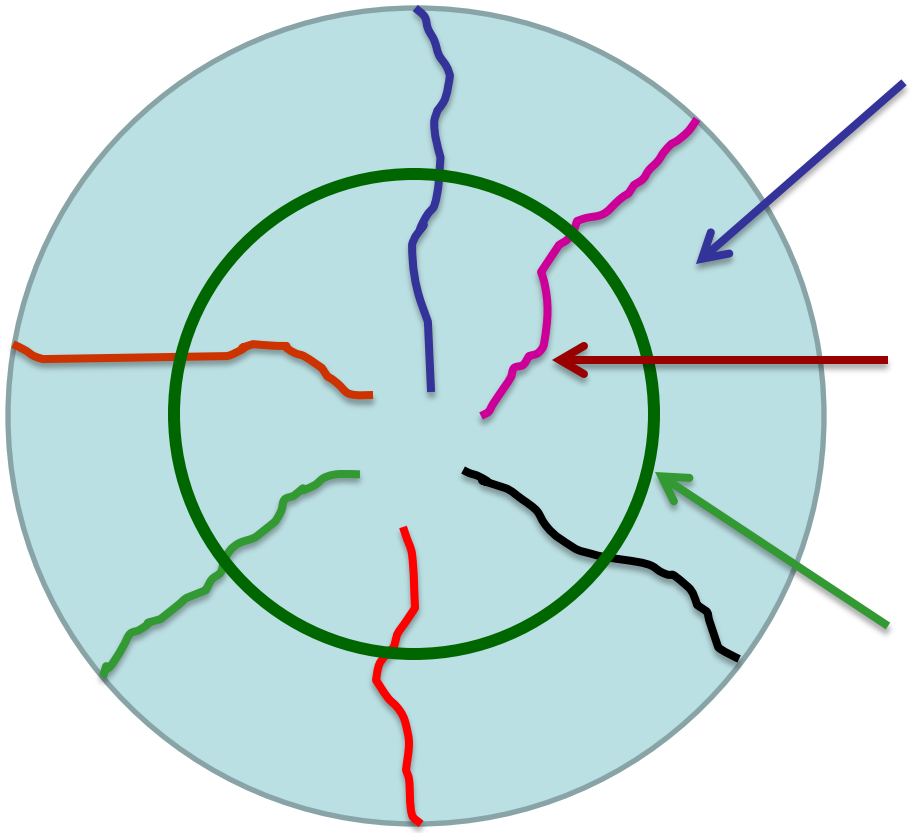
✓ Design
✓ NPP Construction
✓ NPP Operation
✓ Maintenance and Repairing
✓ Human Factors
✓ External Events

Nuclear Power Plant: Systems

Fuel Cycle, Behavior	Mechanical Failure	Design Basis Accidents	Functioning and Reliability
Aging Problems	Severe Accidents	Fission Product Transport	Emergency Response

3. The Reactor Safety Research Program

"Cracking and Expanding" Model -- CEM



R&D Human Resource for nuclear power (as general)

R&D Human Resource for Vietnam (First stage)

R&D Human Resource for Vietnam (Next stage)

3. The Reactor Safety Research Program

Strategic areas to support the NNPPs and VNPP

NPP Design & Construction (D&C)

NPP Operation & Maintenance (O&M)

Reactor Safety (RS)

Other Topics

Nuclear Fuel & Fuel Cycles (FC)

Nuclear Economics (ECO)

3. The Reactor Safety Research Program

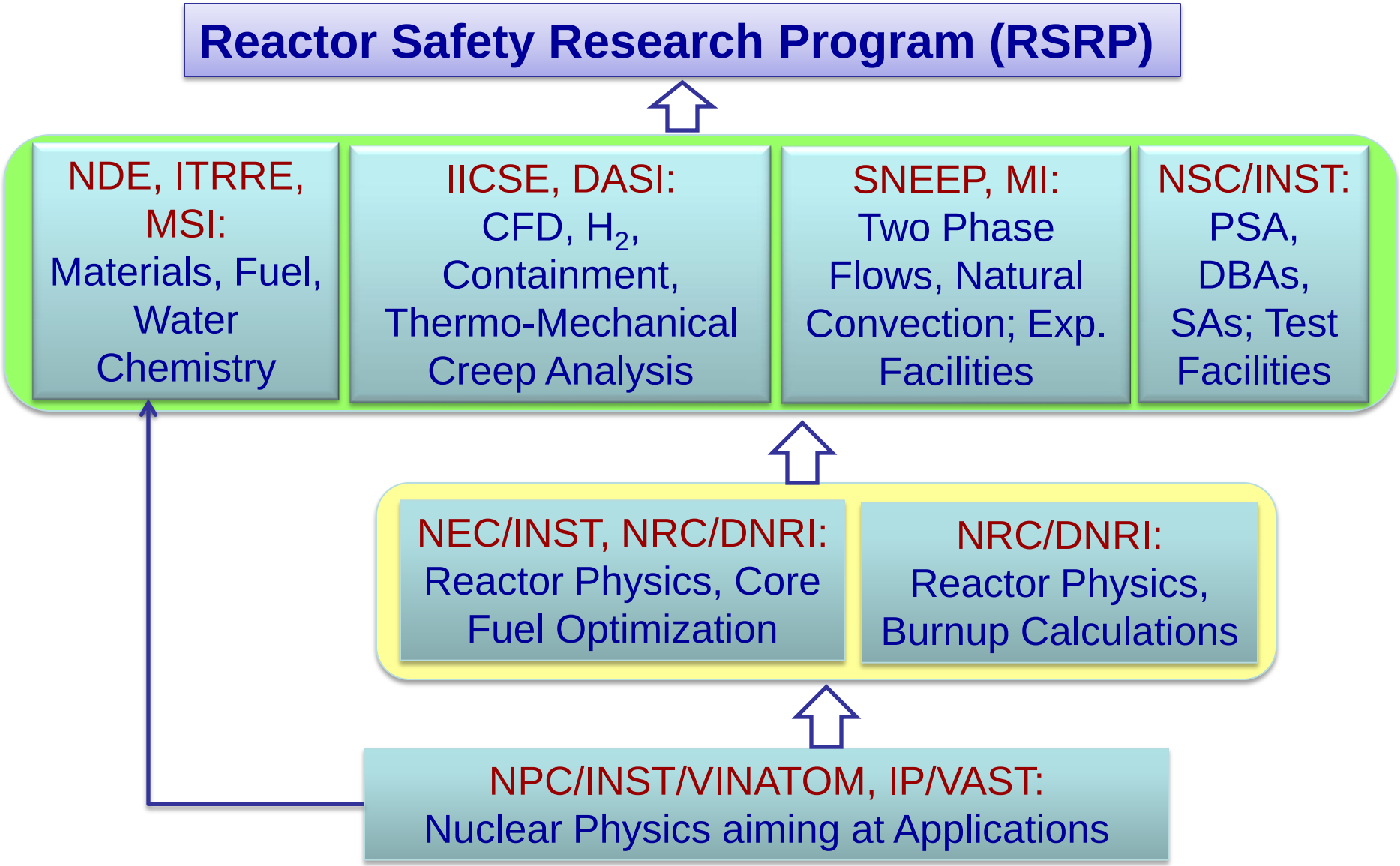
	Issues/ Topics (Focus on 5,6,7,8)	Comment	Area
1	NPP sitting and external events; evaluation of EQ and flooding	*All topics*	D&C
2	NPP construction: Quality control, inspection	*in the first*	D&C
3	Digital I&C system design, performance, compatibility, reliability	*batch have*	O&M
4	HRA: Human reliability analysis (cultural factors)	*strong*	O&M
5	**PSA-L1: Passive safety systems evaluation**	*safety flavor*	RS
6	**PSA-L2: Severe accident management**	*even when*	RS
7	**PSA-L3: Environmental impact and mitigation of a severe accident**	*they are not*	RS
8	**Nuclear fuel & irradiated materials performance and failures**	*classified as*	FC
9	Fuel cycle analysis, incl. issues in nuclear proliferation and security	*“safety”*	FC
10	Energy economics, including rare event consequences		ECO

3. The Reactor Safety Research Program

Strengthening the Research Capability

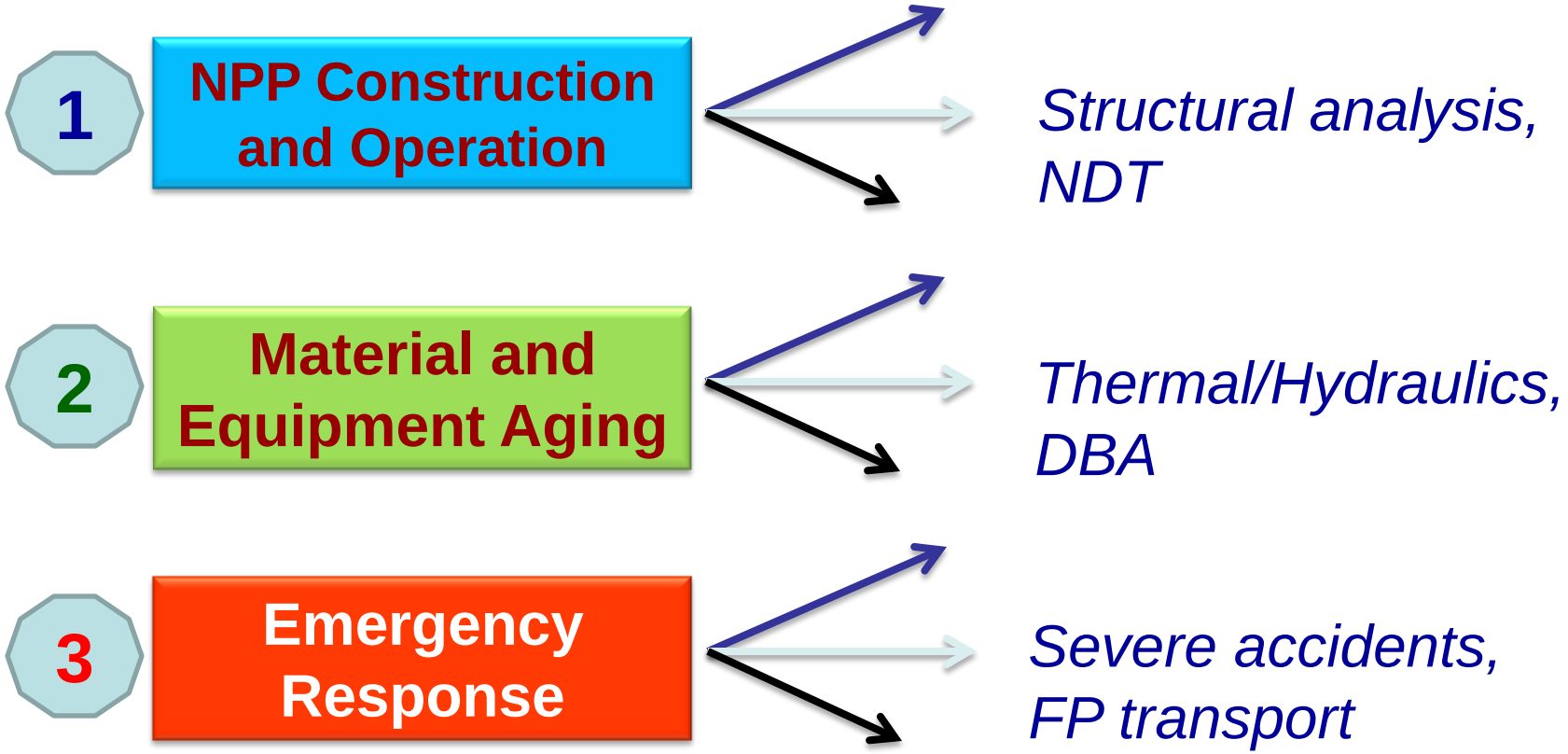
- Vietnam Atomic Energy Institute (VINATOM):
  - *Nuclear Physics Center (NPC)/Institute for Nuclear Science and Technology (INST)*
  - *Nuclear Safety Center (NSC); Nuclear Energy Center (NEC)/INST*
  - *Nuclear Reactor Center (NRC)/Dalat Nuclear Research Institute (DNRI)*
  - *Nuclear Fuel Group (NFG)/Institute for Technology of Radioactive and Rare Elements (ITRRE)*
  - *Reactor Materials Group (RMG)/Non-Destructive Evaluation (NDE)*
- Hanoi University of Science and Technology (HUST):
  - *School of Nuclear Eng. and Environmental Physics (SNEEP)*
  - *Fluid Mechanics and CFD (FMC)*
  - *Int. Institute for Computational Science and Engineering (IICSE) + DASI (ANSYS Representative)*
- Vietnam Academy of Science and Technology (VAST):
  - *Mechanical Institute (MI); Institute of Physics (IP)*
  - *Material Science Institute (MSI)*

3. The Reactor Safety Research Program



3. The Reactor Safety Research Program

Three main topics for research 2016-2020



4. The Center for Nuclear Energy Science and Technology (CNEST)

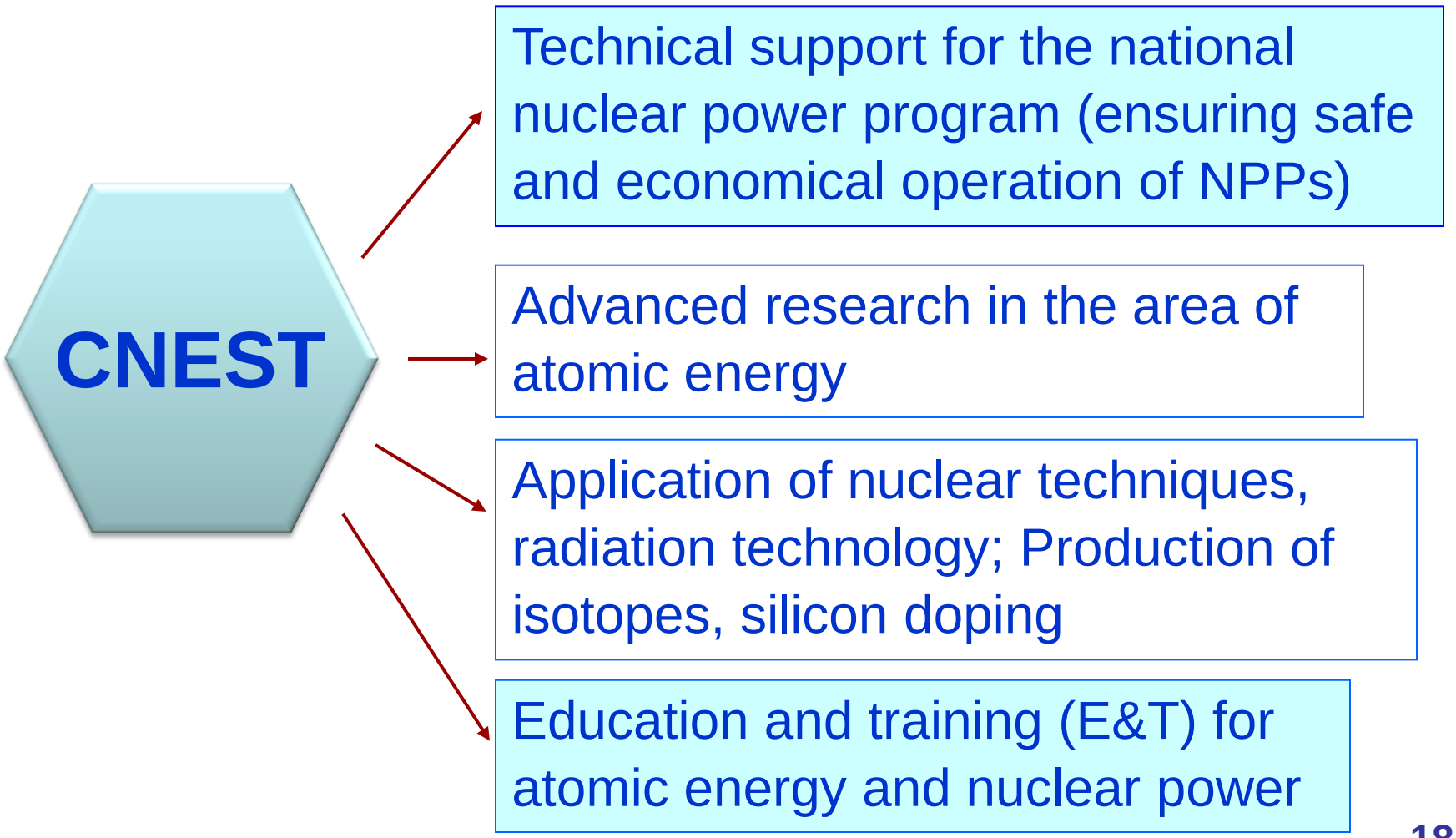
Human resources for the nuclear power program is critical

How is the role of the Center for Nuclear Energy Science and Technology (CNEST)?

✓ *The CNEST is a project between the Vietnam Ministry of Science and Technology (MOST) and ROSATOM*

4. The Center for Nuclear Energy Science and Technology (CNEST)

Main functions of the CNEST

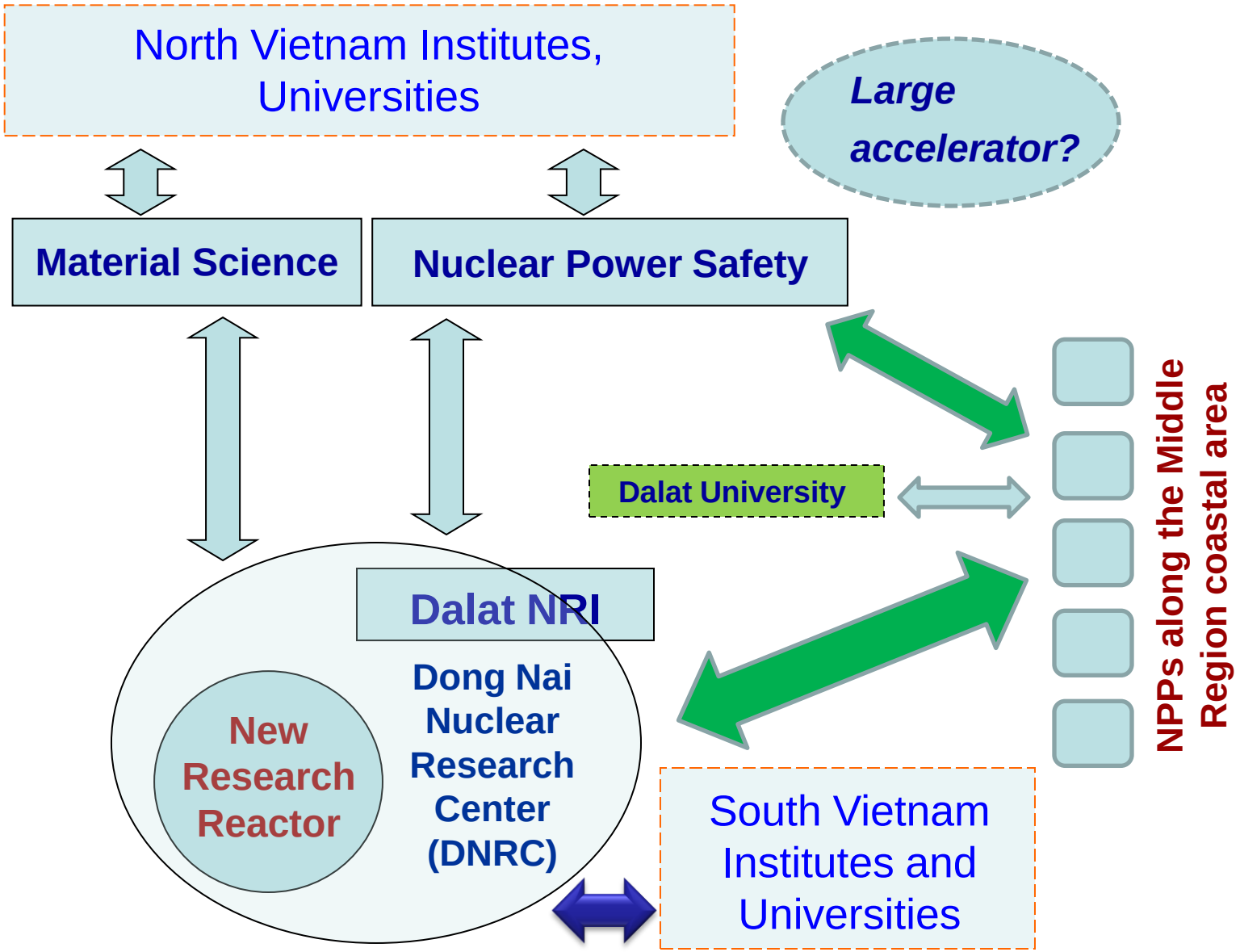


4. The Center for Nuclear Energy Science and Technology (CNEST)

CNEST project: Key milestones

- November 2011: InterGovernment Agreement between Vietnam and RUSSIA
- 2012: Study and evaluation of the site for the new Research Reactor (RR)
- 2013: Strategic areas for R&D, determination of the main components of the CNEST
- End of 2014: Completion of the Terms of Reference (TOR – or technical task) for FS
- *Site selection decision of Vietnamese Government (?)*
- *Beginning of 2015: FS start (?)*

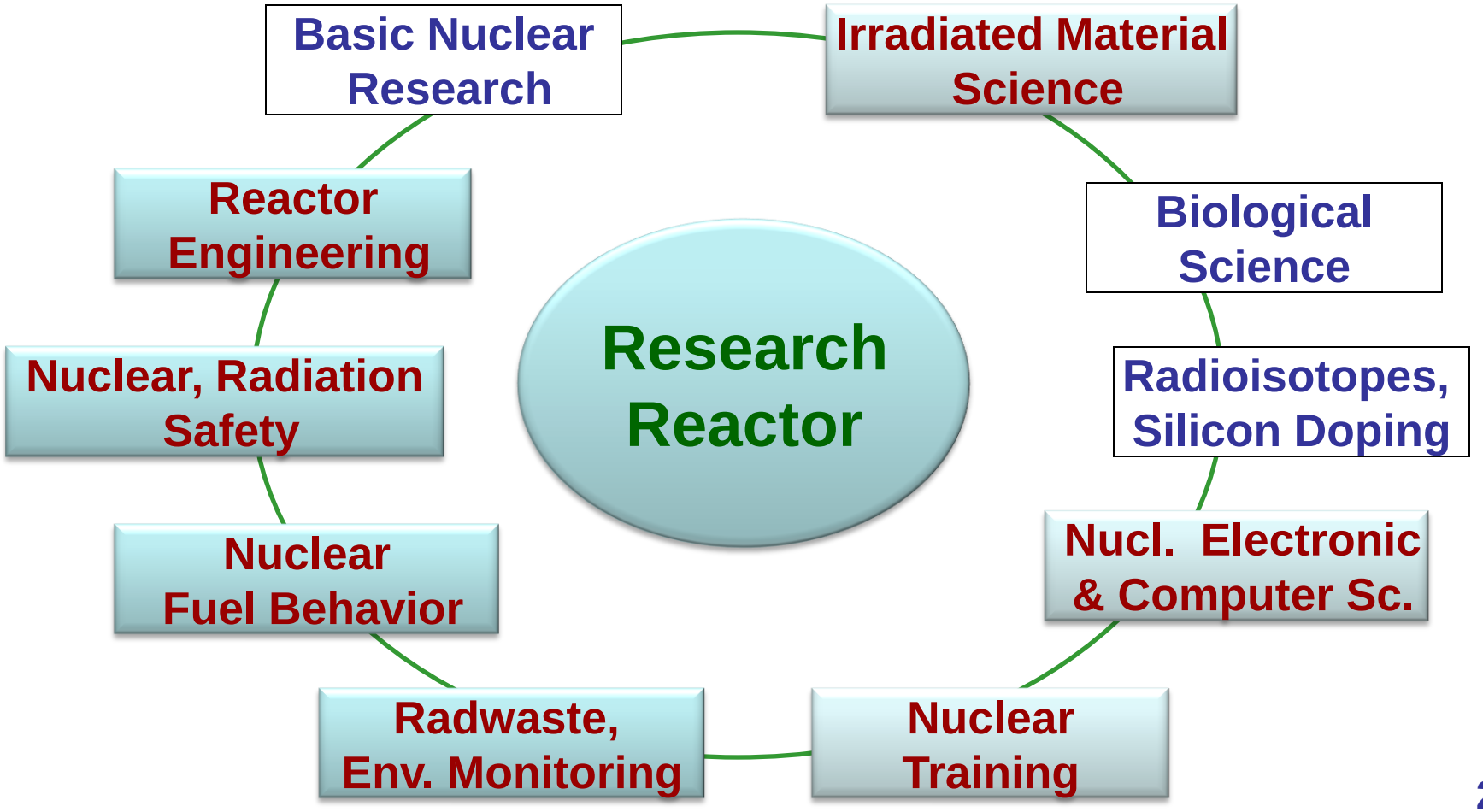
4. The Center for Nuclear Energy Science and Technology (CNEST)



4. The Center for Nuclear Energy Science and Technology (CNEST)

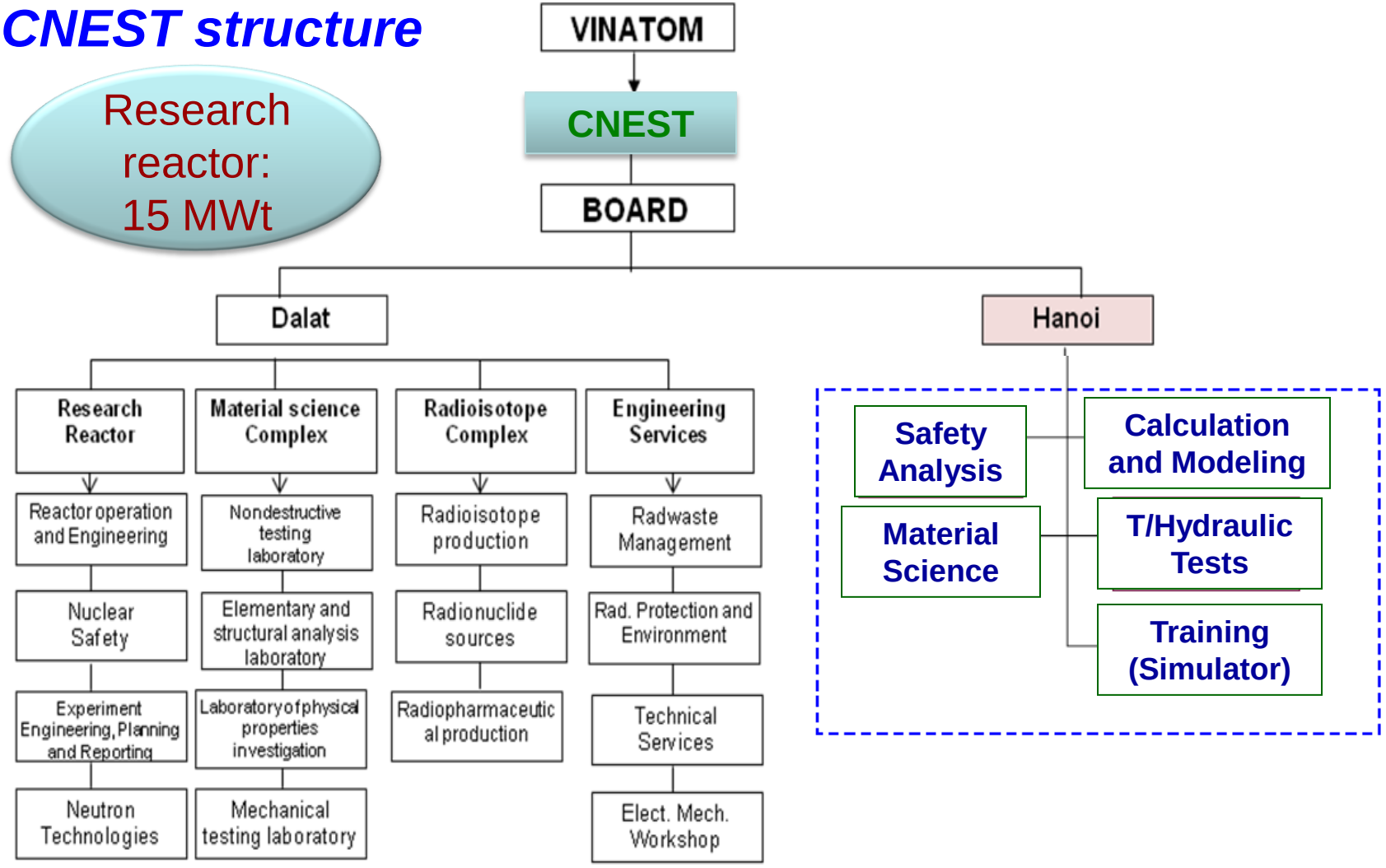
Research orientation with the new RR

Red – related to nuclear power



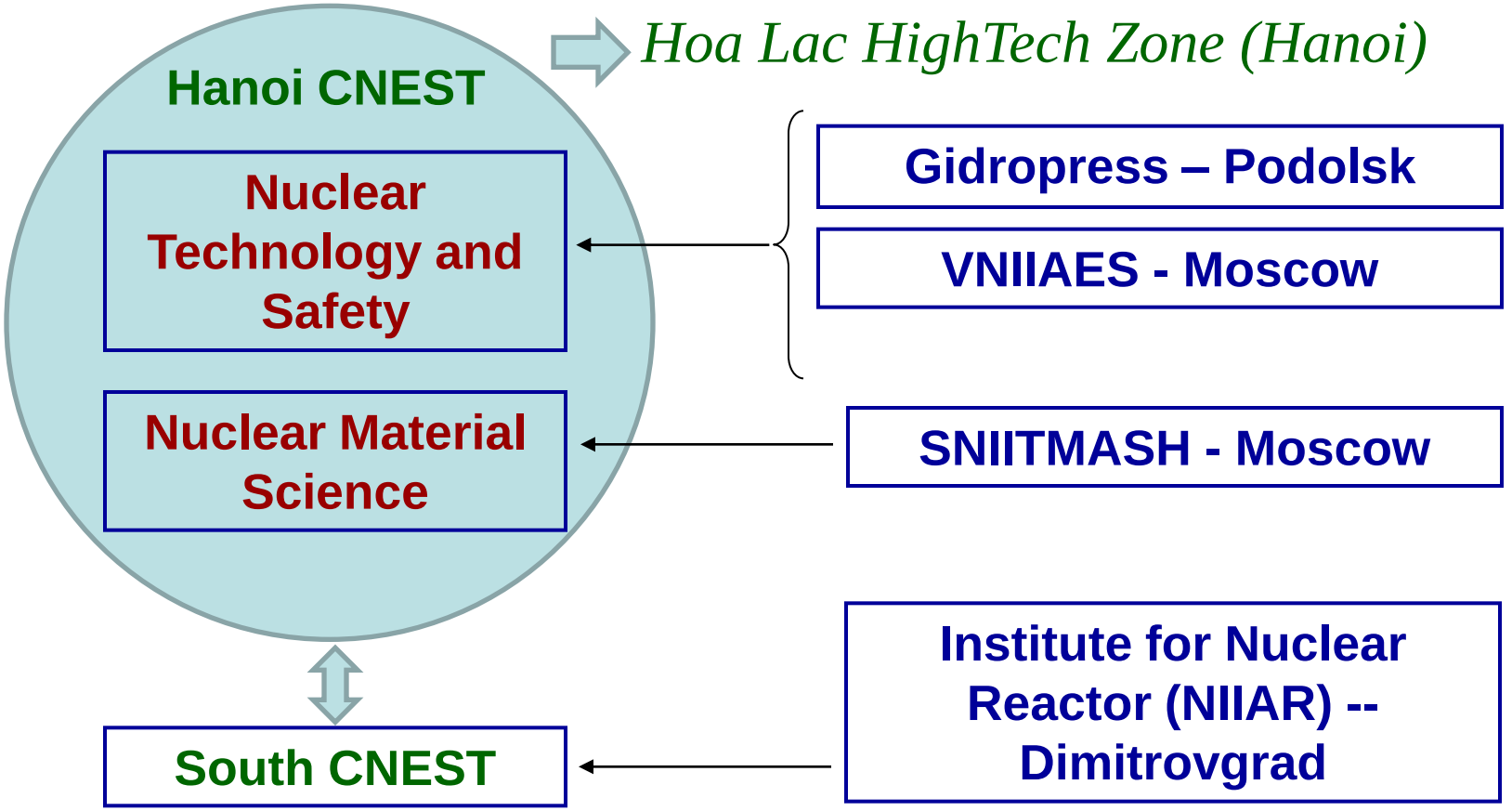
4. The Center for Nuclear Energy Science and Technology (CNEST)

CNEST structure



4. The Center for Nuclear Energy Science and Technology (CNEST)

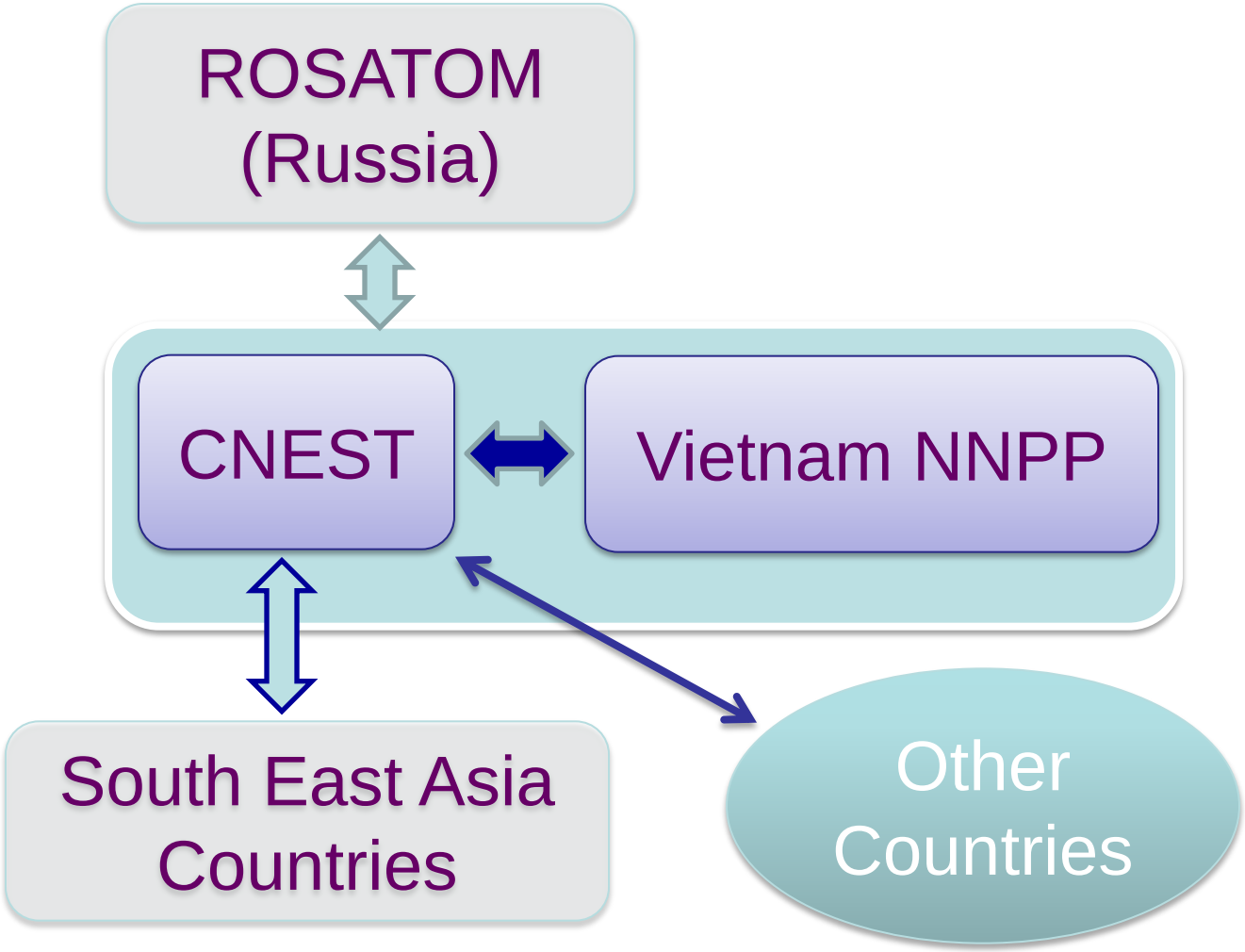
Cooperation with ROSATOM organizations



Vietnam hopes for a comprehensive and intensive cooperation with ROSATOM in HRD through the CNEST project

4. The Center for Nuclear Energy Science and Technology (CNEST)

CNEST can be a regional nuclear ST and ET center



5. Concluding Remarks

- Vietnam has a big nuclear power program (VNPP), the first 2 NPP projects are under consideration (FS phase)
- Vietnam needs to develop a sustainable nuclear power program *(otherwise it can be danger)*
- Nuclear power human resources are a big challenge for the VNPP
- ROSATOM and the Ministry of Science and Technology (MOST) of Vietnam are working on the Center for Nuclear Energy Science and Technology (CNEST) project
- The CNEST may have a significant contribution in the development of sustainable nuclear power program for Vietnam

Thank you!