



## **RSIS Roundtable**

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# Current status of Vietnam Nuclear Power Program and the ASEAN network on nuclear power safety research

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- 1) *Status of Vietnam Nuclear Power Program*
- 2) *The New Research Reactor Project*
- 3) *Supporting Infrastructures*
- 4) *Safety Research Organizational Structure*
- 5) *ASEAN network on nuclear power safety research*
- 6) *Concluding Remarks*

# 1. Status of the Nuclear Power Program



## *History and Current Status*

- Atomic energy in Vietnam started since 1976
- **1984:** Operation of Dalat Research Reactor (RR)
- **1996-2002:** Study on first NPP introduction in Vietnam
- **2002-2009:** Pre-Feasibility Study (Pre-FS) on construction of first NPPs
- **2008:** Atomic Laws approved (to be changed)
- **2010:** Contracts for the Ninh Thuan 1 (NT1) and Ninh Thuan 2 (NT2) NPPs Feasibility Studies (FS) and Dossiers for Site Approval (DSA) – *E4 and JAPC*

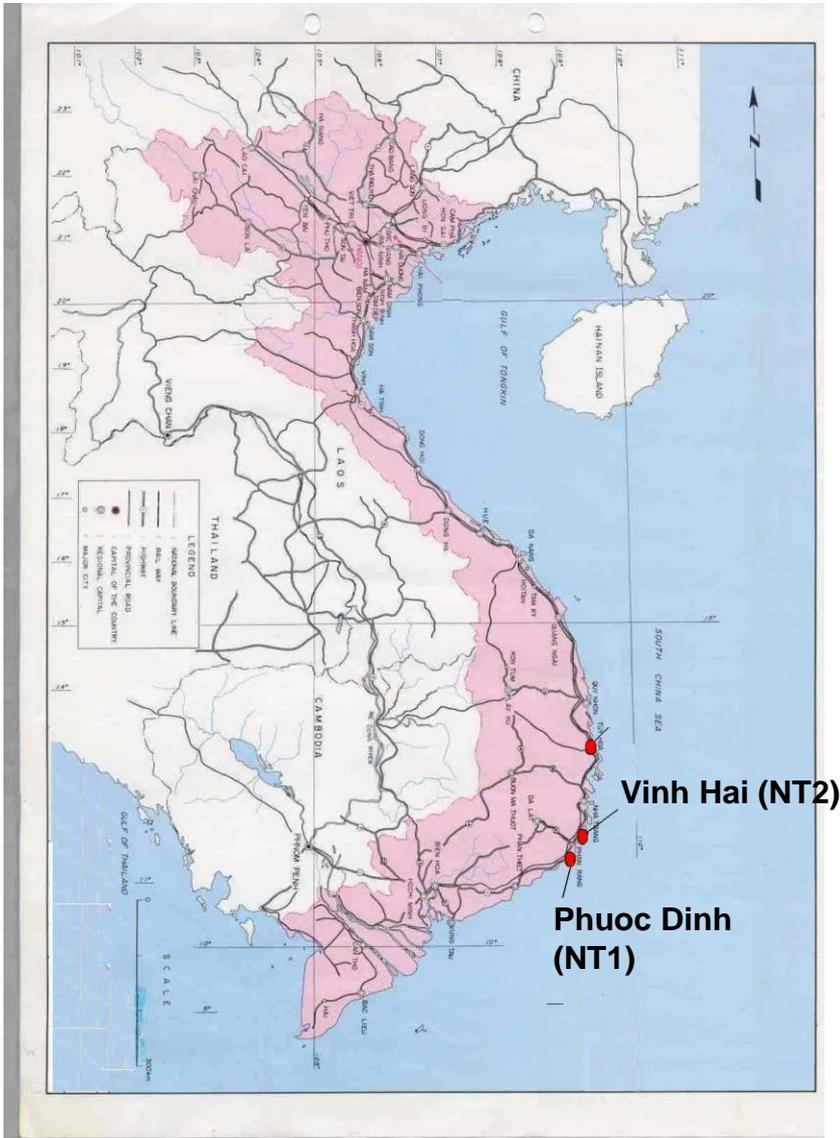
# 1. Status of the Nuclear Power Program



## *History and Current Status (cont.)*

- **December 2013:** Completion of FS (NT1 and NT2)
- **October of 2014:** Revision of FS Report (NT1)
- **Ninh Thuan 2 NPP:** Technology selection is under consideration; Additional survey of site has been carried out by Japan Atomic Power Co. (JAPC)
- **2015:** Review tasks (Focus on Ninh Thuan 1) → Formulation of tasks (Terms of Reference – TOR); Documents/dossier of requirements for selection of a foreign Consultant to perform Review
- **March 07, 2016:** BID for selection of Consultant ...

# 1. Status of the Nuclear Power Program



## *The First 2 NPP Projects*

- ✓ Pre-FS: 2002-2009
- ✓ Ninh Thuan 1 – NT1:  
2x1200 MWe + 2x1200 MWe  
(Operation start: **2028/2029**)
- ✓ Ninh Thuan 2 – NT2:  
2x1000 MWe + 2x1000 MWe  
(Operation start: **2029/2030**)
- ✓ Location:  
300 km from Ho Chi Minh City,  
140 km from Dalat

# 1. Status of the Nuclear Power Program



## Technologies for Ninh Thuan NPP Projects

- Ninh Thuan 1:
  - *AES-91 (Tianwan, China)*
  - *AES-92 (Kudankulam, India; Belene, Bulgaria)*
  - **AES2006/V491** (*Leningrad, Belarus, Kaliningrad-, Czech, Finland?*) – *[Active + Passive]*
  - *AES2006/V392M (Novovoronezh) – [Active + Passive]*
  - *VVER-TOI (Turkey?) – [Active + Passive]*
- Ninh Thuan 2:
  - *ABWR (Hitachi-GE, Toshiba)*
  - *MPWR+/Tomari PWR (Mitsubishi)*
  - **AP1000** (*Westinghouse + Toshiba*) – *Passive Plant*
  - *ATMEA1 (Mitsubishi + Areva)*

Passive Safety is preferable!

## 2. The New Research Reactor Project



### ***Current research reactor (Dalat RR -- DRR)***

- ✓ Pool type TRIGA reactor, built by US
- ✓ The reactor is old: First operation in 1963, reconstructed and restarted in March 1984
- ✓ Small capacity (500 kWt), low neutron flux ( $10^{13}$ )
- ✓ The reactor was converted to LEU in 2011 (Russian fuel VVR, 19.75% of enrichment, enough for ~15 years)
- ✓ Dalat Nuclear Research Institute (DNRI): staff is about more than 200 people
- ✓ Dalat: Remote area, mostly focus on tourism (lacking of other research institutes, universities, appl. centers)

## 2. The New Research Reactor Project

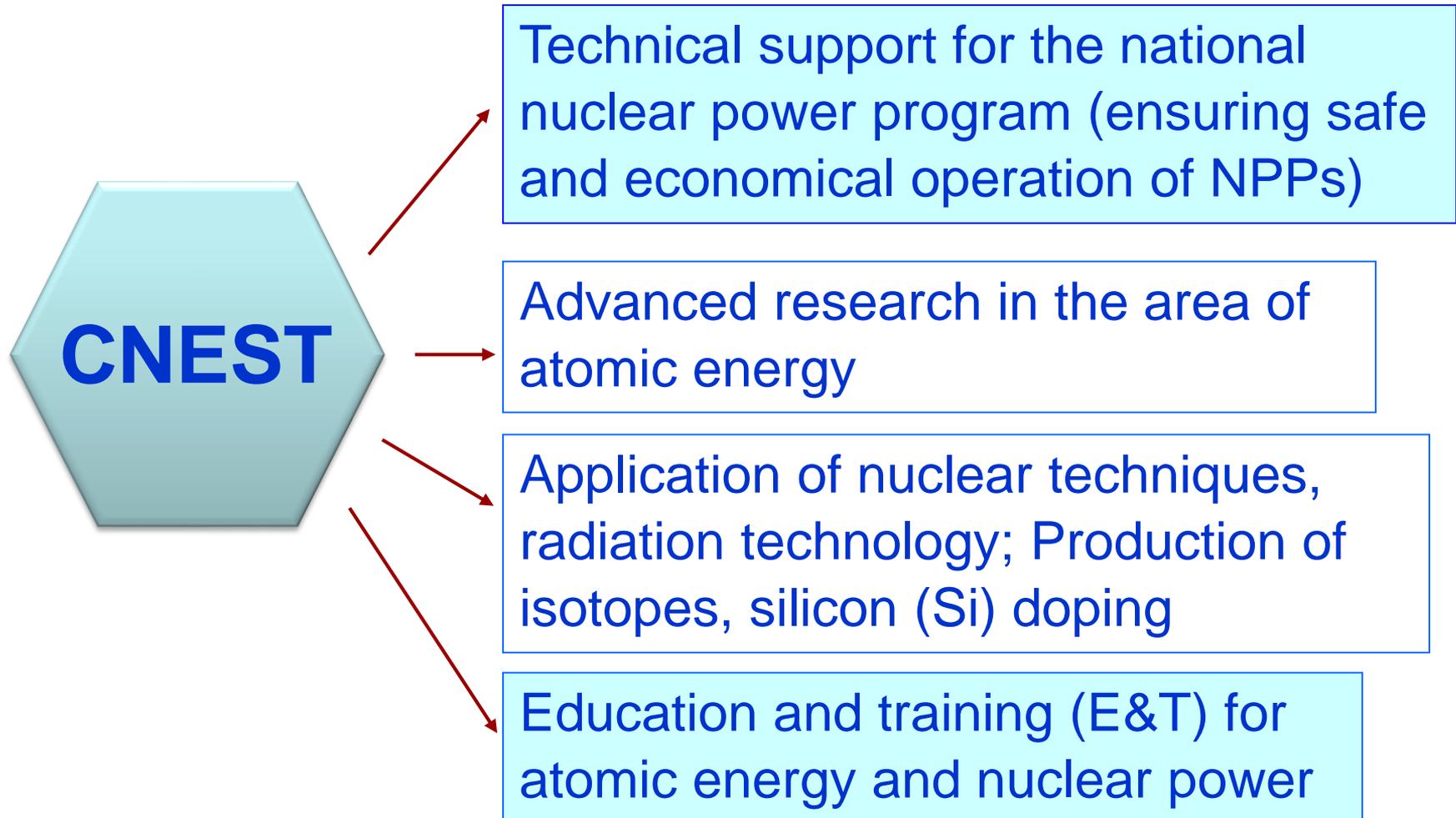


### ***The Center for Nuclear Energy Science and Technology (CNEST)***

- ✓ Vietnam and Russia have signed an Inter-Governmental Agreement (21<sup>st</sup> November 2011) for building of a Center for Nuclear Energy Science and Technology (CNEST) -- < 500 millions USD (Credit from Russia)
- ✓ The main equipment of the CNEST is a new multipurpose Research Reactor (RR) of 15 MWt
- ✓ Other Labs of the CNEST are Non-Destructive Evaluation Techniques (NDET), NPP Systems Modeling and Simulation Center (NSMS), Material Sciences Center (MSC)

## 2. The New Research Reactor Project

### *The main purposes of the CNEST*

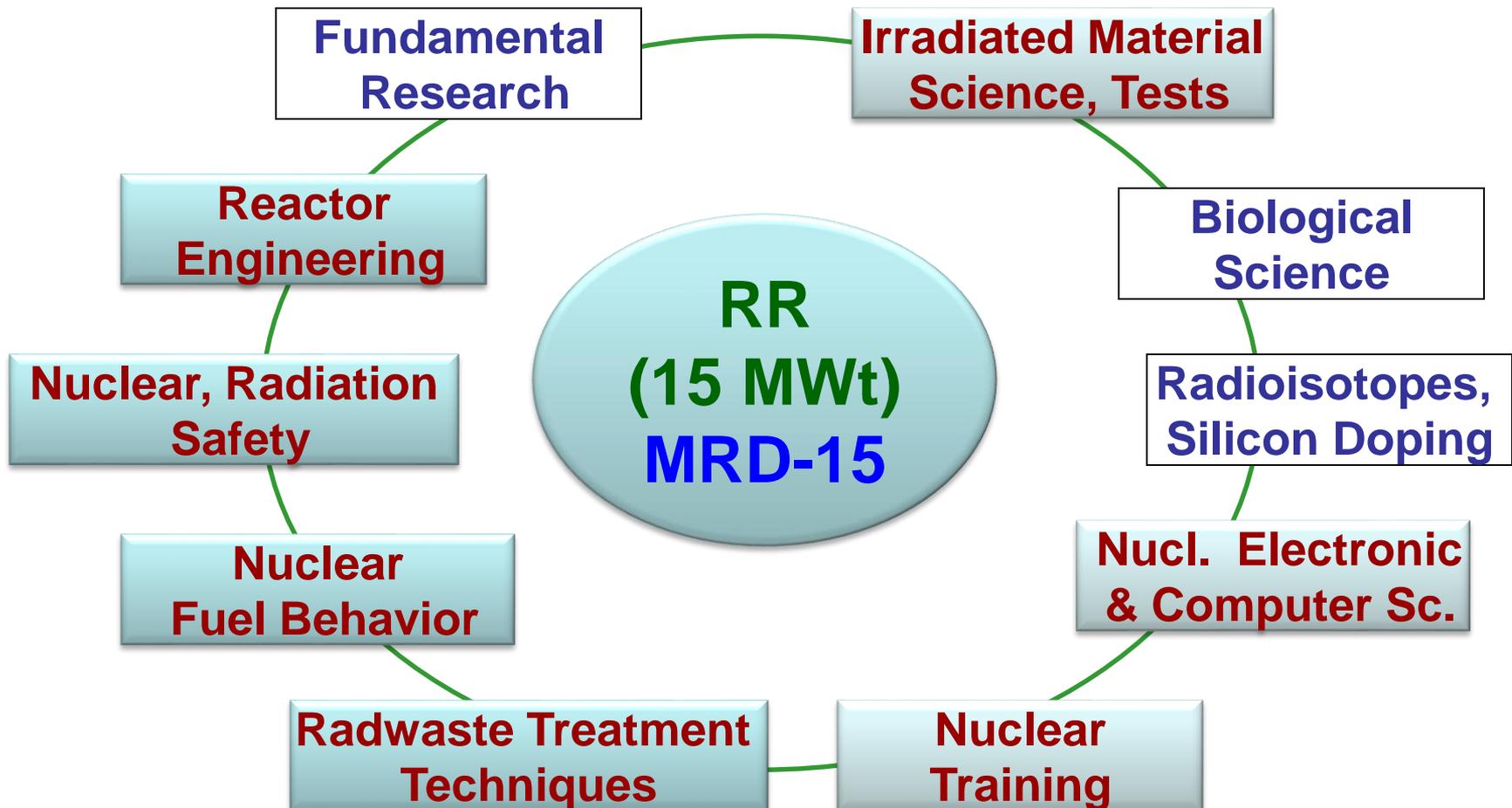


## 2. The New Research Reactor Project

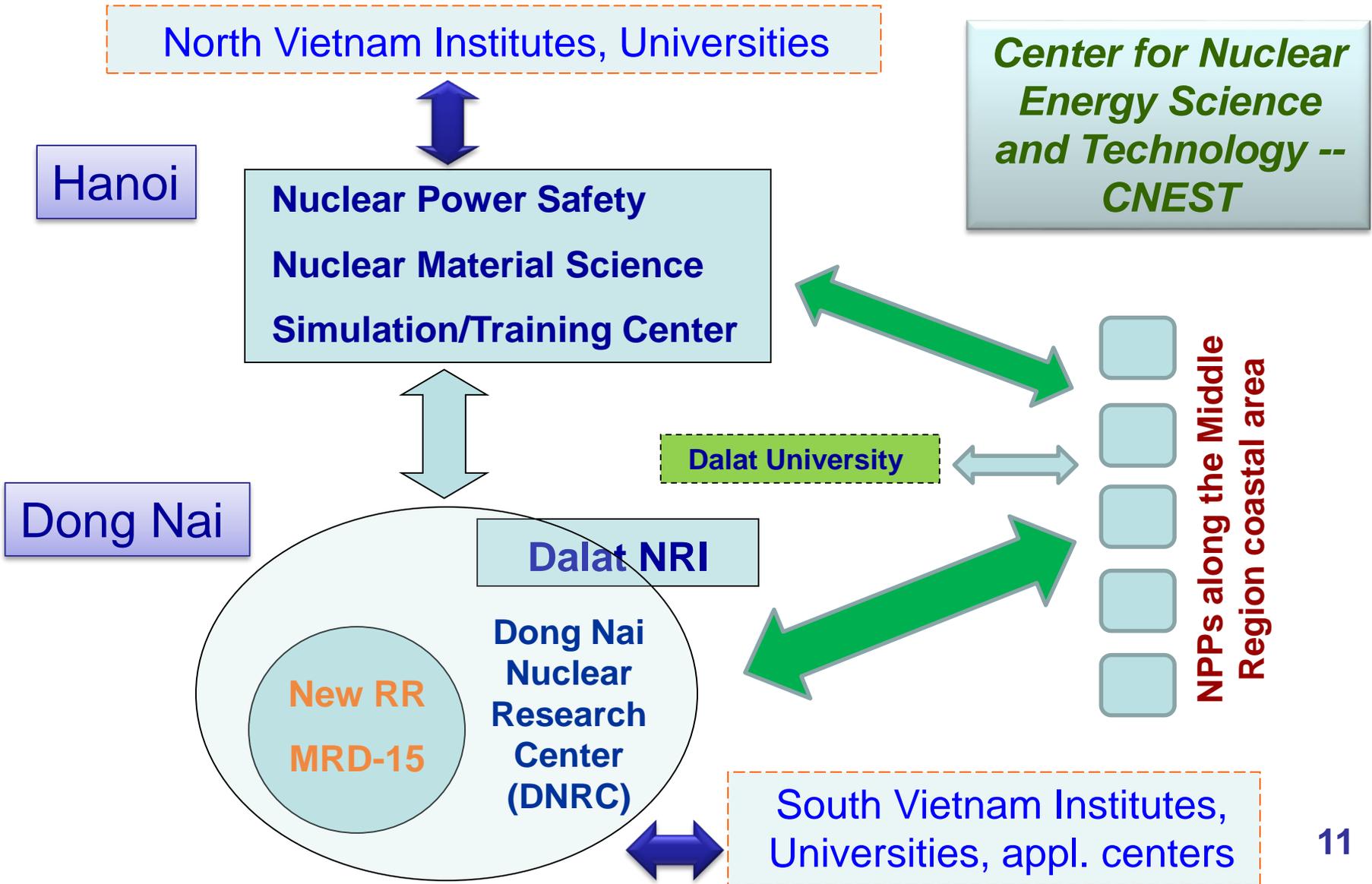


### Research orientation with the new RR

*Red – related to nuclear power*

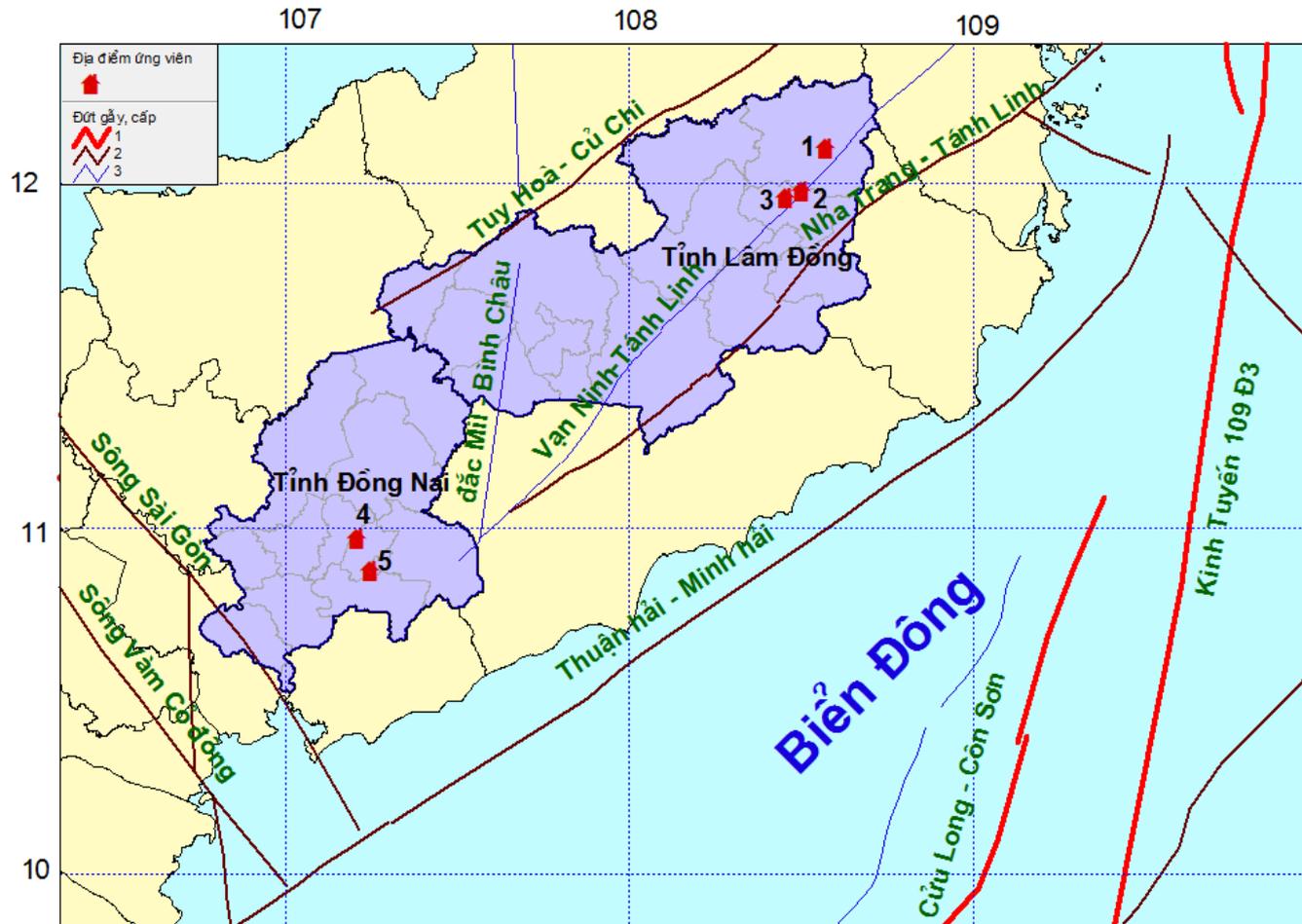


# 2. The New Research Reactor Project



## 2. The New Research Reactor Project

### Sites for the Research Reactor



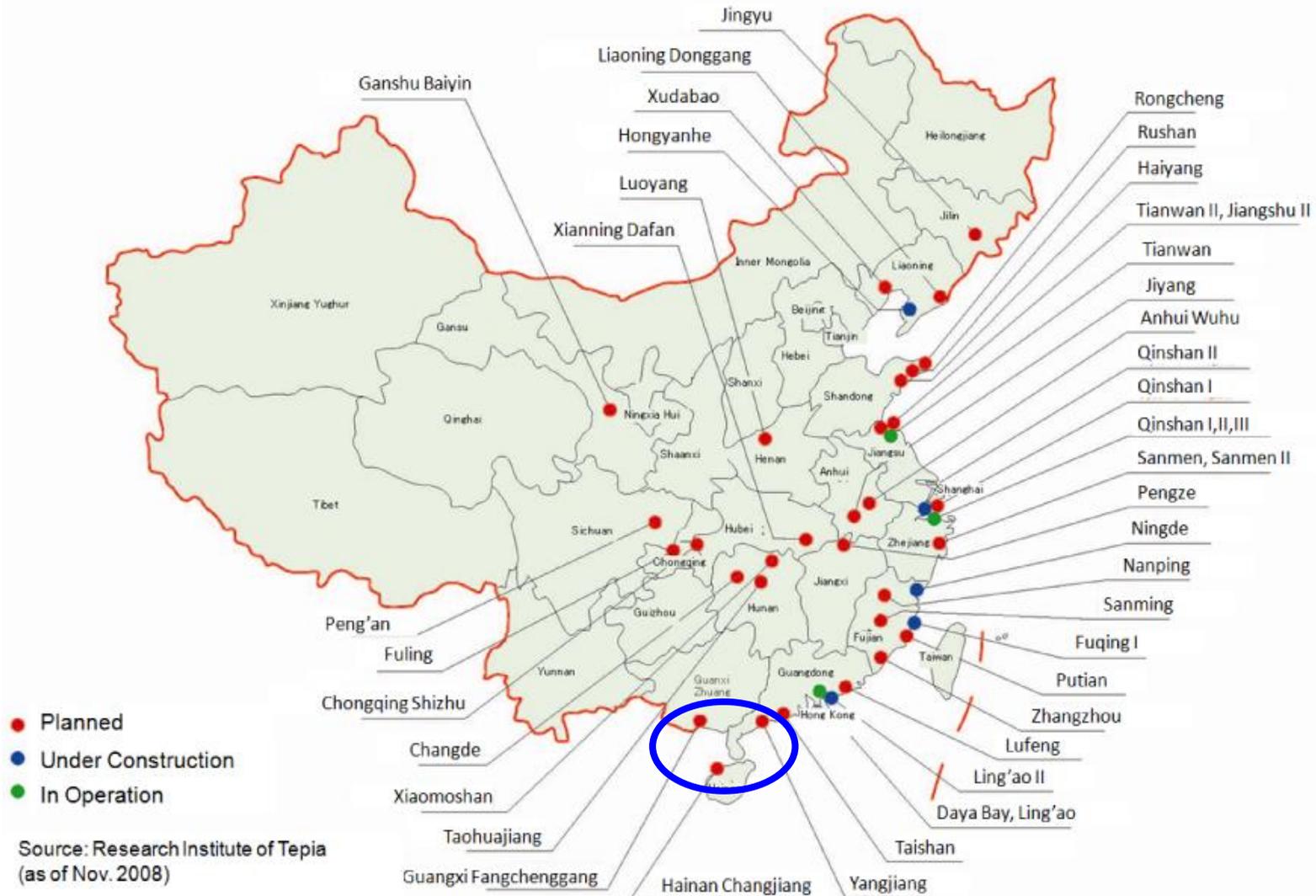
### 3. Supporting Infrastructures



#### ***Radiation Monitoring and Emergency Response***

- 1) Pre-Feasibility has been carried out by VINATOM
- 2) Total cost of the project is about 30-35 millions USD
- 3) Vietnam Government supports the idea to get ODA funding from Japan or other countries -- difficulty
- 4) First phase: Start to build operating center in VINATOM/ Hanoi and few stations; Next phase: To build other regional stations and stations – by Vietnam budget
- 5) ***Today this project becomes more urgent due to operation of Chinese NPPs close to Vietnam***

## Sites of Nuclear Power Plants in China



Source: Research Institute of Tepia (as of Nov. 2008)

### 3. Supporting Infrastructures



VINATOM is building a new unit at Danang.

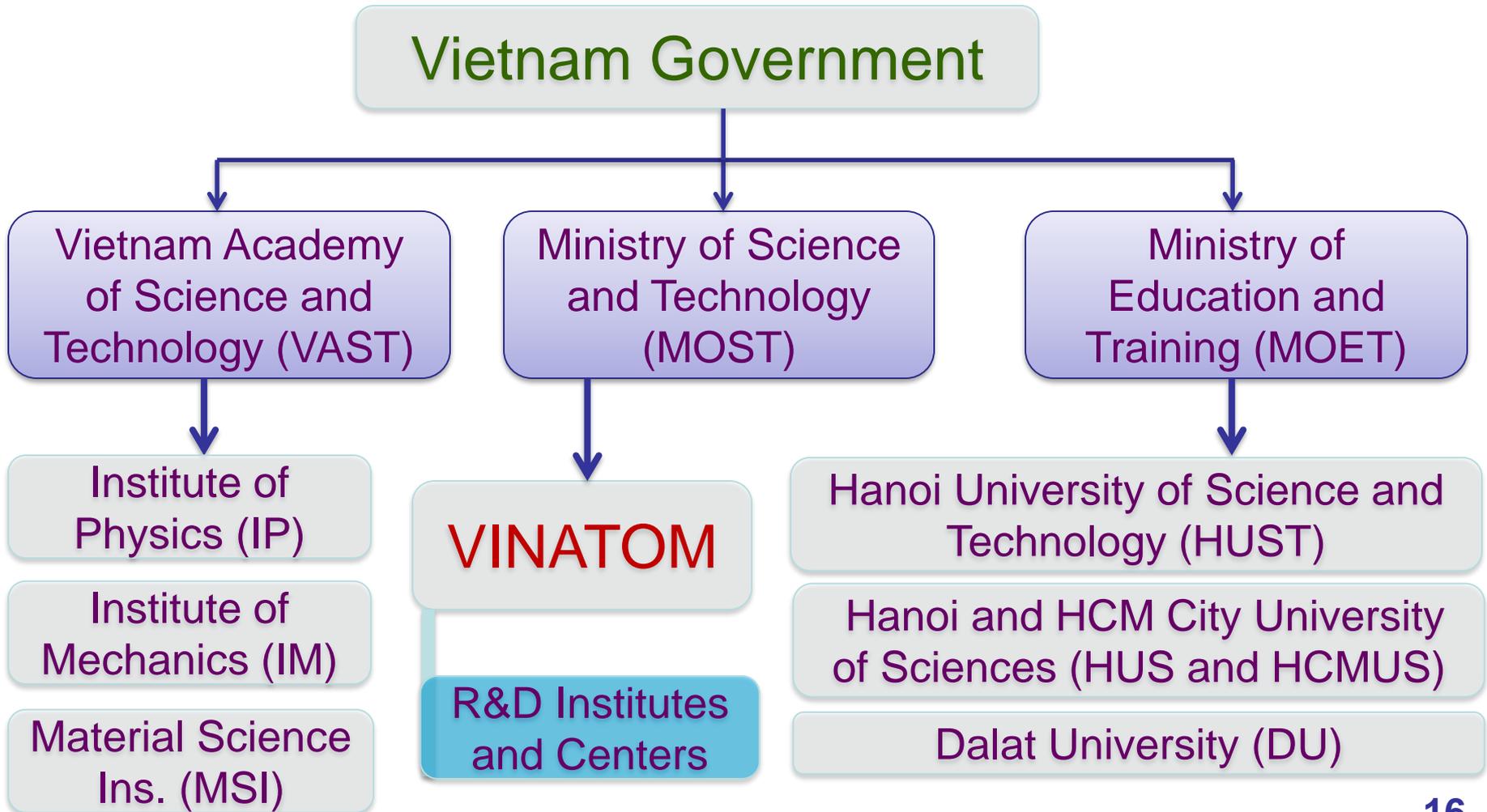
A Marine Environmental Studies Laboratory will be established next year.

**Regional and International cooperation is very important.**

# 4. Safety Research Organizational Structure



## Vietnam Nuclear R&D Organizational Structure



## 4. Safety Research Organizational Structure



### **Relevant Nuclear Safety Research Institutions**

- 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)*

## 4. Safety Research Organizational Structure



### ***Relevant Universities***

- 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)*
- Hanoi National University of Natural Sciences:
  - *Faculty of Nuclear Physics*
  - *Faculty of Radiochemistry*
- HCM City National University of Natural Sciences:
  - *Faculty of Nuclear Physics*
  - *Faculty of Material Sciences*
- Dalat University in Dalat (close to Nuclear Research Institute – NRI/ under VINATOM):
  - *Faculty of Nuclear Physics*
  - *Faculty of Nuclear Engineering*

# Our proposal

*is to establish*

**ASEAN network on nuclear  
power safety research  
(ASEAN2NPSR)**

- **Do not have joint-researches on NPS between ASEAN member states**
  - Realize “horizontal interaction” between ASEAN member states via NPS joint-research programs
- **Promote research and collaboration on NPS between ASEAN member states**
- Share knowledge and experience on NPS research between ASEAN member states

# How to establish the network?

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- Get financial support to establish and maintain the network (from the member states)
- MOUs/protocols signed between ASEAN member states to establish the network
- Establish the steering committee
- Plan and perform joint-research projects on NPS
- Hold workshops periodically to discuss on the joint-research results
- Publish technical reports of the joint-researches
- Make newsletters and progress reports periodically

1. ASEAN2NPSR network
2. Steering committee (SC)
3. **TG 1: NPP technology safety research**
4. **TG 2: Atmospheric dispersion assessment**
5. **TG 3: Oceanic dispersal assessment**
6. **TG 4: Regulatory and safety issues (RSI)**
7. Trainings and workshops (T&W)
8. Newsletters and progress reports (NPR)

## 6. Concluding Remarks



- ✓ Vietnam has started the nuclear power program which consist of 10 units in the next 15-30 years
- ✓ Until 2030, Vietnam will implement Ninh Thuan 1 and Ninh Thuan 2 projects, to construct and operate 4 units (4600 MW)
- ✓ The Vietnam Nuclear Power Program (VNPP) is ambitious and challenging. For safe, economic and sustainable development of nuclear power, Vietnam Government recently has approved several policies, strategies and projects to support the VNPP ...
- ✓ Human Resource Development (HRD) is key for the Vietnam Nuclear Power Program (VNPP), regional and international cooperation will play an essential role for the HRD in this time period.

## 6. Concluding Remarks



- ✓ Vietnam has a plan to build a new Research Reactor (RR):  
pool type reactor; 15 MWt in the next 10-12 years to  
replace the current RR
- ✓ Infrastructure for the new RR project is almost available
- ✓ Challenges for the RR project: Commitment from the  
Government; Site selection; Budget and fundings;  
Research plan and RR utilization; Regulatory system  
and procedure (RR project); and Public acceptance
- ✓ **Support/Regional cooperation from the ASEAN  
countries to overcome the challenges and difficulties is  
necessary**

## 6. Concluding Remarks



- Regional cooperation is extremely important for Vietnam. Especially in terms of information exchange, technical collaboration, sharing the data of monitoring...
- VINATOM is ready for cooperation in:
  - ✓ Nuclear physics, reactor physics (including design, implementation and operation of the new research reactor)
  - ✓ NPP designs and nuclear safety
  - ✓ Fission Product (FP) transport and environment monitoring
  - ✓ Marine Environmental Studies
- **The ASEAN network on nuclear power safety research (ASEAN2NPSR) should be established ASAP.**

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*Thank you!*