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The IAEA Technical Supports in Capacity Building for Long Term Energy and Nuclear Power Assessment and Planning in Viet Nam

Le Doan Phac
Vietnam Atomic Energy Commission

Contents

1. Introduction

Introduction

- Capital: Hanoi
- Population: 86 millions (2009)
- Area: 333,688 km^2
- 3,700 km of frontier with China, Cambodia, and Laos;
- 3,260 km of sea coast with South China Sea, and Gulf of Thailand
- The Red River Delta: 12,500 km^2 in the North and the Mekong River Delta: 39,600 km^2 in the South

Introduction (cont'd)

- In 1989 Vietnamese Government launched a "Doi moi" policy aimed at step by step shifting country's economy from planned central economy to market economy oriented socialism. As a result Vietnam's economy has been being developed steady and rapidly.
- Together with economy growth, demands on energy and electricity, in particular, have increased remarkably, with annually average energy growth rates being around 10% and annually average electricity growth rates being around 15% in a long period.
- Total electricity generation amount in 2008 is 73.7 TWh. Demand for electricity is expected to continue rising up to 318 TWh and 655 TWh in 2020 and 2030, respectively.

Introduction (cont'd)

- Although Viet Nam has various primary energy reserves, the supply from indigenous primary energy resources will not meet electricity demand in the near future.
- Viet Nam recognizes the need for energy diversification as well as the impact of its choices on the environment. Therefore, nuclear power is taken into consideration as an option, which meet targets on energy supply security and sustainable development.
- In the process of conducting studies on national energy development, Viet Nam has received cooperation and supports from international, regional organizations, and nuclear leading countries, of which the IAEA's assistances plays a very significant and important role.

2. Studies on Nuclear Power Development in Viet Nam

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Point of view on NP Development

- NP is an inviternable choice while fossil fuel resourses have been being exhausted;
- However, decison on NP development is not only based on the exhaustion of indigenuous primary energy resources. The decision reflects a strategic view on the country's industrialization and modernization, strengthening national science & technology capability, hamorniously diversifying energy supply sources for ensuring energy security and sustainable development.
- **Therefore, develop NP not wait until indigenous primary energy resources exhausted.**

2. Studies on Nuclear Power Development (cont'd)

- Since 1996, studies on sustainable energy development taking into consideration the introduction of nuclear power into Viet Nam have been being carried out The studies cover all energy-related aspects:
  - ✓ Projections on the socio-economic development, energy demand, and science and technologies development;
  - ✓ Evaluation of energy supply capabilities from the indigenous energy resources and import, including energy saving and nuclear power;
  - ✓ Assessment of environment impacts caused by energy sector; and
  - ✓ Design, assessment of energy system; optimization of energy expansion planning; etc.

2. Studies on Nuclear Power Development (cont'd)

- Vietnamese Government has approved the following energy programme and projects:
  - ✓ National Programme on Sustainable Energy Development (1996-2000);
  - ✓ Project on General Study on the Introduction of Nuclear Power into Viet Nam (1996-1999);
  - ✓ Project on Formulation of the Strategy for Atomic Energy Utilization for Peaceful Purposes up to 2020 (issued on 23 January 2006);
  - ✓ Project on Study and Elucidation of the Aspects of Nuclear Power Development in Viet Nam (2002-2004);
  - ✓ Project on Pre-Feasibility Study (Pre-FS) for Construction of the First Nuclear Power Plant in Viet Nam (from 2002 to now); and
  - ✓ National Energy/Electricity Development Master Plans.

2. Studies on Nuclear Power Development (cont'd)

- Viet Nam has decided that it will utilize nuclear power to meet some its energy needs.
- A pre-feasibility study for the first nuclear power plant of total capacity of 4,000 MW, which is planned to be built at the two sites in the southern province Ninh Thuan of Viet Nam, has been submitted to the Government, showing the first unit to be put commercial operation by 2020-2022.
- Nuclear power capacity share of the total electricity capacity of the country is expected to be increased from 2% (in 2020) to 8% (in 2030). Eventually, it is planned that 25% - 30% of Viet Nam's power needs will be met by nuclear power in 2050.

Ninh Thuan NPP's Sites

- **1st Plant: Ninh Thuan I**

  Site: Phuoc Dinh commune

  Ninh Phuoc district

- **2nd Plant: Ninh Thuan II**

  Site: Vinh Hai commune

  Ninh Hai district

Potential NPP Sites: 10

3. Viet Nam and IAEA Collaboration

3. Viet Nam and IAEA Collaboration (cont'd)

- Became a Member State of the IAEA since June 1978, Socialist Republic of Viet Nam has been receiving the Agency's valuable assistances in many areas, contributing to the research, development and peaceful, safe and secure uses of nuclear energy in Viet Nam.
- Under the TC Programme, the IAEA has provided Viet Nam with the equipment, materials, experts and man-power training. The IAEA TC projects covered almost fields, including health care, agriculture, industry, education and training, especially in the nuclear energy system assessment for long term planning and development.

3. Viet Nam and IAEA Collaboration (cont'd)

- In order to meet Viet Nam's requirements on support for consideration of launching nuclear power project, IAEA focused its supports in assisting Viet Nam to carry out studies on national infrastructure development for nuclear power. Among the IAEA TC projects for the cycle 2009-2011, there are three projects directly supported nuclear power development in Viet Nam, namely:
  - ✓ VIE/4/015 "Developing Nuclear Power Infrastructure";
  - ✓ VIE/9/011 "Improving the Capability for the site Characterization and Evaluation of New Nuclear Installation'; and
  - ✓ VIE/9/013 "Strengthening the Technical Capacity of the Radiation and Nuclear Safety Regulatory Body".

4. IAEA's Assistance to Viet Nam on Energy and Nuclear Power Assessment and Planning

4. IAEA's Assistance to Viet Nam…

- In 1987, Viet Nam received a WASP-III version for PC. At the same year, IAEA approved TC Project "Computer Center for Reactor Physics (VIE/4/006)“. WASP was installed in the PC Center. Vietnamese researchers and energy planners carried out their energy/electricity planning studies by using WASP at this Center.
- In 1997, the IAEA approved TC project **"Pre-Feasibility Study for Introduction of Nuclear Power in Viet Nam (VIE/0/009)".** In order for implementation of the project, two Vietnamese working teams was set up, one for energy planning and economic study, the other for reactor technology, safety... Almost energy-related institutes and universities participated in and benefited by the project.

4. IAEA's Assistance to Viet Nam (cont'd)

- Since year 2000, Viet Nam has participated in the following energy-related regional projects:
  - ✓ RAS/0/033: Role of Nuclear Power and Other Energy Options in Mitigating Green House Gas (GHG) Emissions.
  - ✓ RAS/0/038: Role of Nuclear Power and Other Energy Options in Competitive Electricity Market.
  - ✓ RAS/0/041: Tracing Future Sustainable Path through Nuclear and Other Energy Options.
  - ✓ RAS/0/045: Formulation of Sustainable Energy Development strategies in the Context of Climate Change.
- From 2007, especially since 1996 many Vietnamese staff participated in the IAEA training courses in WASP energy planning, e.g. at ANL (1996, 1998, 2006), CEA/Saclay (1997), Islamabad (1999), ICTP (2002, 2003) KAERI (2000-2008), 4 fellowships, and Viet Nam hosted 1 TM, 2 WS, 2 NTC; and IAEA expert missions to Viet Nam.

4.1. Uses of IAEA Energy Models in Viet Nam

- Viet Nam has been transferred by the IAEA the following energy models and tools: WASP (III, IV), ENPEP (BALANCE, MAED, ELECTRIC, IMPACT), DECADES, FINPLAN, SIMPACTS, MESSAGE...
- BALANCE has been used for calculation of energy demand-supply balance. MAED has been used as a useful tool for projection of energy demand.
- WASP, ELECTRIC are recognized as efficient tools for optimization of electricity expansion planning. They are used in several research institutes for studies on formulation of Electricity Development Master Plans during the period 1996-2004.

4.1. Uses of IAEA Energy Models (cont'd)

- IMPACT has been used for assessment of environment impacts of electricity generation expansion projects.
- SIMPACT has been applied in some studies for evaluation of impacts to people health caused by thermal power plants.
- FINPLAN is a useful tool for analysis of feasibility of investment and financial arrangement for energy projects.
- MESSAGE is used for study on renewable energy planning; and
- DECADES version 1.01 provided in 1998. But, it has not been used longer.

4.1. Uses of IAEA Energy Models (cont'd)

- There are Non-IAEA energy models being used in Viet Nam, such as: MEDEE-S, ETB, EFORM-ENV, MARKAL; STRATEGIST, and SMIPLE-E.
- Optimal energy expansion planning and study on the introduction of nuclear power in Viet Nam have been carried out by combined uses of IAEA and Non-IAEA energy models/tools
- Being involved in the energy planning and studies, there are many institutions, e.g.: MPI/ISD, MOIT/IE, MOST/VAEC, MOET/HUT, VAST/IEST…

4.2. Comments on IAEA Energy Models

- Besides the considerable benefits obtaining from the using of IAEA energy models, we have some comments on the difficulties on and limits of using them as follows:
  - The difficulties in using MAED in Viet Nam are mainly caused by the lack of national data. Therefore, we had to use a lot of assumptions;
  - WASP, ELECTRIC are of some limitations due to not consider the role of interconnection in electric system. However, if it does not take into consideration interconnection of power generation sources, WASP and ELECTRIC meet rather well requirements for optimization of electricity generation sources system;
  - IMPACT simply estimates pollutant amount discharged directly to the environment from electric power plants. It can not solve the problem on dispersion in the environment;
  - MESSAGE is a good model, but users wish more improvements on demo case, build-in references, and manual;

4. IAEA's Assistance to Viet Nam (cont'd)

- Therefore, in the process of using energy models, we have:
  - ✓ set up steering group and working group composed of senior energy experts;
  - ✓ studied methodology to find advantage and disadvantage of each model to choose the model suitable with each concrete problem;
  - ✓ collected expert opinions through workshops and seminars;
  - ✓ referred data, expertise of other regional countries, which have experienced development periods similar to our present situation;
  - ✓ made cross-checking, one problem can be independently solved by some models at different institutions. The obtained results are compared each other;
  - ✓ combined use of models, including non-IAEA models; and
  - ✓ updated results, National Energy Development Master Plan (for period 10 yeas) is usually revised and updated every 5 years;

5. Conclusions

Conclusions

- Viet Nam has experienced a long-time cooperation with the IAEA in the nuclear energy system assessment for long term planning and development. IAEA had been the main partner of Viet Nam in conducting studies on planning and economics of nuclear power in the period 1996-2004. This is a stage very important for studies on the introduction of nuclear power into Viet Nam
- IAEA's technical supports, especially manpower training, helped Viet Nam in capacity building for long-term energy assessment and planning and has contributed to the national decision-making on energy/electricity and nuclear power development, namely:

Conclusions (cont'd)

- ✓ Providing state-of-the art software tools on energy/electricity planning and updated information on the nuclear power development necessary for implementation of Pre-FS;
- ✓ Training Vietnamese qualified staff used the Agency's energy planning tools for forecasting demand, developing optimal expansion plans, and assessing environmental impacts;
- ✓ Improving capacity of Viet Nam in carrying out analyses and assessment of GHG mitigation potentials within the energy sector including nuclear power as one important option and developing capacity in analysis of flexible mechanism;
- ✓ Developing capability in the country in analysing the role of nuclear power in competitive electricity market and in the electric power generation expansion plan;
- ✓ Enhancing the capabilities of Vietnamese researchers and energy planners to define sustainable energy strategies; and

Conclusions (cont'd)

- ✓ Strengthening the sustainable development of Viet Nam in the post-Kyoto period by assessing the role of nuclear and other energy options and evaluating the resources for energy-related activities and environmental concerns.

- The cooperation between Viet Nam - IAEA, especially the IAEA's assistance in capacity building in Viet Nam for long-term energy assessment and planning is a good example for those Member States, which are embarking to the Nuclear Power Programme.
- Viet Nam wish to continue obtaining the IAEA's supports to solve problems occurred in nuclear power development through the IAEA experts' review and assessment of not only energy planning and economy but also other issues as suggested in the IAEA Publication: *Milestone in the Development of a National Infrastructure for Nuclear Power (IAEA Nuclear Energy Series No. NG-G-3.1)*

Thank you
for your attention