

# Nuclear Power Project in Thailand

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### 1. BACKGROUND

The Electricity Generating Authority of Thailand (EGAT), the main power producer in Thailand, was first interested in nuclear power as an electricity option in 1967 when the electricity demand increased considerably for the first time as a result of the economic and industrial growth. Its viability had been assessed several times during the early seventies in relation to the changing factors. Finally in the late 1970s, the proceeding with nuclear option was suspended for a variety of reasons, for instance, public opposition, economic repercussion and the uncovering of the indigenous petroleum resources. Nonetheless, EGAT continued to maintain a core of nuclear expertise.

During 1980s, faced with dwindling indigenous fossil fuel resources and restrictions on the use of further hydro as an energy source, EGAT had essentially reconsidered introducing nuclear power plants to provide a significant fraction to the long term future electricity demand. The studies on feasibility, siting and environmental impacts were conducted. However, the project was never implemented due to economics crisis in 1999 and strong opposition by environmentalists and activists groups. The 1986 Chernobyl disaster was an important cause.

After a long dormant period, the nuclear power is now reviewed as one part of the solution for future energy supply in the country. Thailand currently relies on natural gas for 70 percent of its electricity, with the rest coming from oil, coal and hydro-power. One-third of the natural gas consumed in Thailand is imported, mainly from neighbouring Myanmar. According to Power Development Plan (PDP) 2007 rev.2, the total installed electricity capacity will increase from 28,530.3 MW in 2007 to 44,281 MW by the end of plan in 2021. Significantly increasing energy demand, concerns over climate change and dependence on overseas supplies of fossil fuels, all turn out in a favor of nuclear power. Under the current PDP (as revised in 2009), two 1,000-megawatt nuclear power plants, about 5% of total installed electricity capacity in the country, are expected to start operations during 2020-2021. EGAT will be responsible as the owner and operator of these first units of nuclear power.

### 2. NUCLEAR POWER PLANNING

Thailand Power Development Plan 2007 – 2021 (PDP 2007) was formulated by the Electricity Generating Authority of Thailand (EGAT), based on the load forecast for the case of moderate economic prepared by Thailand Load Forecast Sub-committee. It was developed under the policy framework of the Ministry of Energy, in terms of reliability of power supply, fuel diversification, power purchase from neighboring countries, and power demand forecast, etc. The PDP 2007 was approved by the National Energy Policy Council (NEPC) and endorsed by the cabinet. According to the plan (as approved in 2007), nuclear power

plants producing 4,000 MW are to be included to the power system during 2020 – 2021. However, in early 2009, the plan was revised due to the economic downturn. The nuclear power capacity in the revised plan, so called PDP2007 rev.2, is reduced from 4,000 MW to 2,000 MW.

After the approval of the original PDP2007, the NEPC appointed the Nuclear Power Infrastructure Preparation Committee (NPIPC) to prepare nuclear power infrastructure establishment plans (NPIEP) and a nuclear utility plan. With advice and guidance from IAEA experts, the plan was established considering all aspects related to the introduction and implementation on nuclear power program. The NPIEP activities are divided into 5 phases as follows:

Phase 0.1: Preliminary Phase – 1 year (2007)

- Appoint NPIPC and 7 sub-committees
- Consider issues and milestones
- Prepare NPIEP

Phase 1: Pre-Project Activity Phase – 3 years (2008-2010)

- Approve the NPIEP
- Set up Nuclear Power Program Development Office (NPPDO)
- Start infrastructure work to accommodate the NPP
- Survey potential sites for NPP construction
- Complete the NPP feasibility study
- Carry out public communication to create knowledge, understanding and public participation

Phase 2: Program Implementation Phase – 3 years (2011–2013)

- Implement NPIEP with milestones
- Establish full Nuclear Regulatory Body (NRB)
- Enact legislation and international protocol
- Select suitable sites for bidding
- Select technology qualified suppliers
- Prepare to call bids

Phase 3: NPP Construction Phase – 6 years (2014-2019)

- Fully implement NPIEP
- Complete bidding process
- Design and engineering
- Manufacturing
- Construction and installation
- Test runs and inspection
- NPP commissioning license

Phase 4: Start NPP Operation Phase – (from 2020)

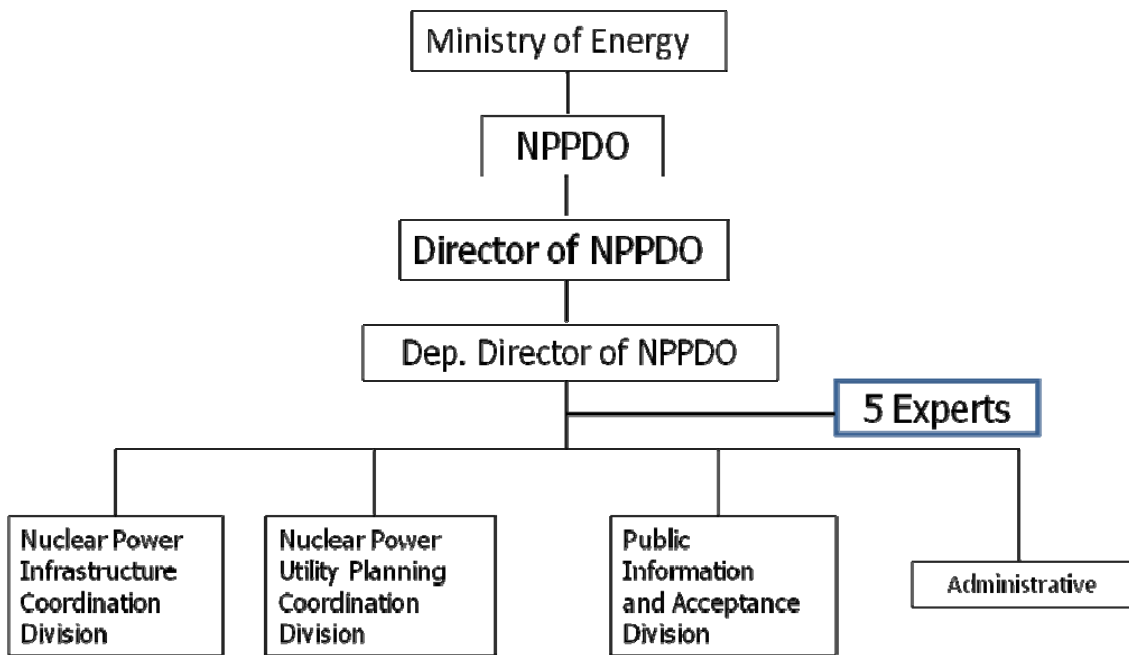
- Commercial operation
- Operation and maintenance
- Planning for expansion
- Industrial and technology development plan

In the end of 2007, the Thai cabinet approved the NPIEP and the budget for the establishment of NPPDO and the NPIEP implementation in pre-project activity phase during 2008-2010. The Nuclear Power Infrastructure Establishment Coordination Committee (NPIECC) was appointed as a steering committee

for this nuclear power project, chaired by the Deputy Permanent Secretary of Energy, Dr. Norkhun Sittiphong.

In January 2008, the NPPDO was established under the Ministry of Energy to coordinate all activities related to the national nuclear power infrastructure establishment which are planned in Phase 1. The organization structure of NPPDO is shown in Figure 1. It is functioned by 5 experts responsible for each area of:

- project planning and management
- nuclear technology and nuclear safety
- economics and financing
- public communication and acceptance
- law, regulatory system and international protocols



*Fig. 1. Structure of NPPDO*

The following 5 sub-committees have been appointed to assist the NPIECC with the coordination of NPIEP implementation:

1. Sub-committee on legal, regulatory system and international protocols
2. Sub-committee on nuclear power utility planning
3. Sub-committee on industrial and commercial infrastructure, technology development and transfer, and human resources development
4. Sub-committee on nuclear safety and environmental protection
5. Sub-committee on public communication and public participation

Above mentioned sub-committees will work in close cooperation and collaboration to implement the plan. Members in the steering committee and each sub-committee are key officials from various government agencies and organizations in related ministries e.g. Ministry of Energy, Ministry of Science and Technology, Ministry of National Resources and the Environment, and Ministry of Education. Since it is the first nuclear power project, assistance is needed from the experienced countries in nuclear power. The

collaborations with foreign partners are encouraged to support the program. International Atomic Energy Agency (IAEA) has provided assistance in terms of consultations, technical visits, and training personnel including seminars and workshops.

### **3. CURRENT STATUS**

Implementation of the first nuclear power requires that Thailand establishes the basic infrastructure as a minimum to deal with all aspects in the project. In the pre-project reactivity phase, the basic infrastructure will be examined to the extent needed in the implementation stage, which includes the development program on industrial and commercial infrastructure, technology and transfer, human resources, and safety and environmental protection and the preparation of setting up the regulatory body and regulatory framework on nuclear power.

During 2008-2010, the pre-feasibility study and site investigation have been conducting by consultant, Burns and Roe Asia, to study nuclear power possibility in Thailand. The study focuses on the virtues of energy economics and financing analyses; reactor technology assessment on PWR, BWR, and PHWR with capacity ranging from 1,000 MWe to 1,350 MWe; nuclear power project schedule development; and human resource development plan. The study on the site selection is being performed based on the IAEA siting criteria in conjunction with the general plant requirements. Several candidate sites will be ultimately selected for the first nuclear power station.

Thai nuclear law is currently primarily focused on the use of nuclear energy for research and medical purposes and is too narrow in its scope to apply to nuclear power for commercial use. At this initial stage, significant additional legal framework will be required in order to set the ground for a robust commercial nuclear energy program. In early 2009, The Office of Atoms for Peace (OAP), as assigned to be regulatory authority, awarded a contract to Chulalongkorn University for drafting the rules and regulations related to nuclear power, which will cover all concerned issues such as licensing process, siting, radiation protection, emergency preparedness, environmental impact analysis, fuel cycle, commissioning, spent fuel and radioactive waste, safety management, operational limits and conditions, licensing for operators, and decommissioning.

One of the important issues for introducing nuclear power in Thailand is the public acceptance. People are still haunted by the accident of Chernobyl, even though the nuclear technology has greatly advanced. The lack of knowledge and understandings are observed to be the cause of such fear. Consequently, the public awareness and participation are being promoted to increase the accurate understandings of nuclear technology for its safety and protection. To date, a number of public acceptance campaign activities have been conducted such as seminars, exhibitions and publications together with local communications.

In 2011, according to the present plan, the cabinet will make a decision and a final approval on the construction of nuclear power based on the results of feasibility study and information on infrastructure readiness, utility readiness, and public acceptance. After the final decision to "GO NUCLEAR", three years would be needed for the program implementation to prepare all necessary issues and plan a clear roadmap for nuclear power-plant construction. Six years after that the plant's construction will be completed. Following the plan, eleven years from now the first nuclear power plant expected to come online in Thailand.