

International Atomic Energy Agency

OVERVIEW OF TECHNOLOGY ASSESSMENT

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Objectives of Technology Assessment

Main Objective of Technology Assessment

The main objective of the Technology Assessment is to determine which Nuclear Energy System (NES) technologies meet the needs and requirements of the country.

(NES technologies are defined to include Nuclear Power Plant (NPP) designs and associated fuel-cycle and supporting technologies.)



Other Objectives of Technology Assessment

The Technology Assessment also facilitates the following specific applications:

- **to provide technical rational for the decision to introduce nuclear power in the country;**
- **to provide technical basis for several elements of national infrastructure development required for the introduction of NES;**
- **to provide technical input to the formulation of the NES deployment strategy and plan; and**
- **to provide technical basis for the final selection of NPP design and associated NES technology, including preparation of bid invitation documents and bid evaluation guidance.**



Some Simplified Questions to Be Replied in a Technology Assessment

- **What kind of NPP is needed and when?**
- **What kind of NPP designs are available?**
- **How do the available NPP designs meet the needs of the country?**
- **How should selected NPP designs and/or the requirements of the country be modified in order to achieve a compliance?**
- **How should the infrastructure be developed?**
- **What are strategies and next steps subsequent to the Technology Assessment?**



Limitations and Clarifications of Technology Assessment



Scope Variations of Technology Assessment

- **The scope of the Technology Assessment can vary from country to country depending on several factors, like**
 - **the status of nuclear activities**
 - **the status of infrastructure development**
 - **the nuclear power introduction approach, e.g.**
 - **bidding process**
 - **bilaterally negotiated delivery contract**
- **Usually, it is not the objective of the Technology Assessment to compare possible NPP designs with each other and arrange them into order of superiority. That is the task of the bid evaluation.**



Technology Assessment vs. Feasibility Study

”Feasibility Study” has been defined and used in various different contexts in the past, for examples

- **‘a study to show that nuclear power is feasible in a country’;**
- **‘all technical studies prior to the bid invitation’;**
- **‘a study to determine whether a particular NPP design is feasible to be constructed in a country’.**

For clarity purpose, the term ”Feasibility Study” will not be used in the Technology Assessment activity.



Technology Assessment vs. Infrastructure

- **Technology Assessment is conducted in two directions regarding infrastructure:**
 - **It generates General Criteria derived from the infrastructure elements in a country.**
 - **It gives guidance and technical bases for the infrastructure development that is necessary for adopting a particular NPP design.**
- **Only those NPP designs fulfilling the General Criteria reasonably well and creating only manageable additions and modifications to the infrastructure can be regarded possible (acceptable).**



Position of the Technology Assessment in the Nuclear Power Programme

Phases and Milestones in the Development of a National Infrastructure for Nuclear Power

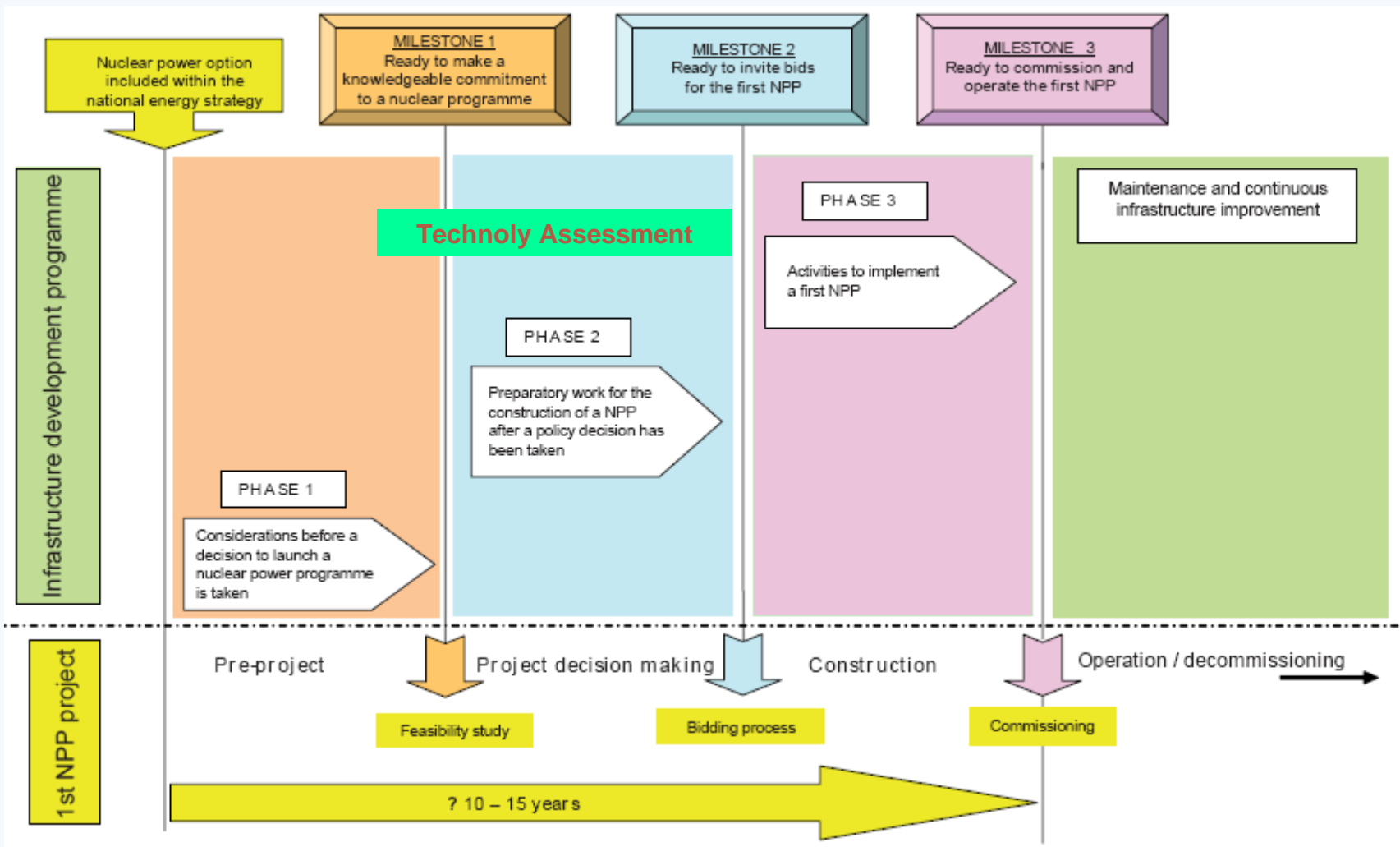
Main phases and **milestones** at the end of each phase:

1. Considerations before a decision to launch a nuclear power programme is taken;
Milestone 1: Ready to make a knowledgeable commitment to a nuclear programme;
2. Preparatory work for the construction of an NPP after a policy decision has been taken;
Milestone 2: Ready to invite bids for the first nuclear power plant;
3. Activities to implement the first NPP.
Milestone 3: Ready to commission and operate the first nuclear power plant.

The Technology Assessment takes place mainly during Phase 2. However, it utilizes widely information and data produced by activities during the earlier phase and activities that are parallel with the Technology Assessment.



Infrastructure Development Programme



Technology Assessment Process

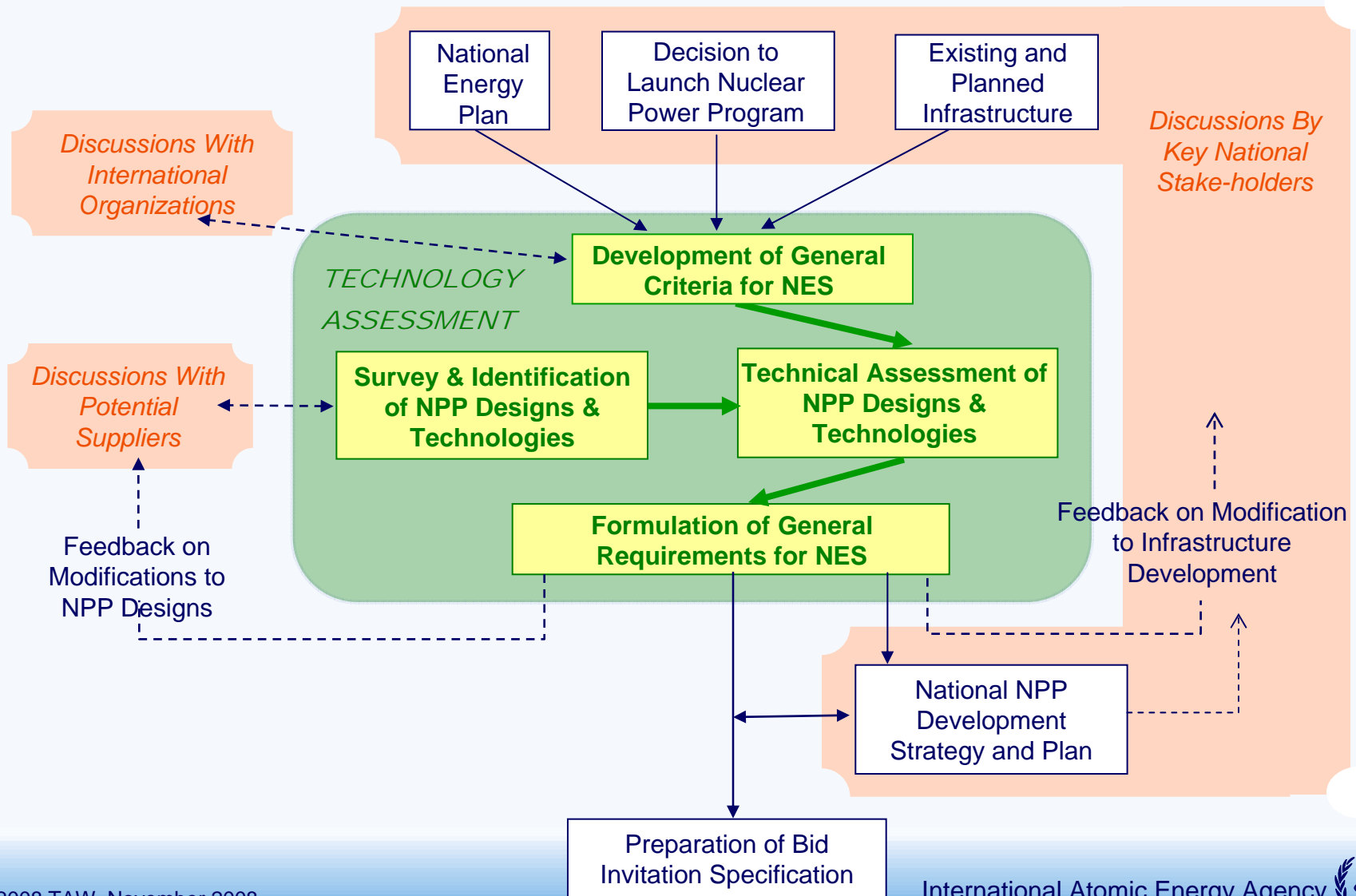
Main Activities of the Technology Assessment Process

A typical Technology Assessment process includes the following main activities:

- **Development of the General Criteria for NES based on**
 - national energy plan,
 - national infrastructure,
 - local conditions,
 - regulatory requirements, and
 - other relevant national strategies.
- **Survey and identification of NPP designs and associated NES technologies that are commercially available and may potentially meet the General Criteria;**
- **Assessment of the selected NPP designs against the General Criteria;**
- **Expansion of the General Criteria with additional details and its formulation into the General Requirements for NES.**



Scope of Technology Assessment



Development of General Criteria

Development of General criteria

- **The General Criteria should be compiled in a single document that can be utilised in the Technology Assessment process, especially in dealings with NPP supplier candidates.**
- **During the Technology Assessment process, the General Criteria can be improved and revised based on feedback from the results of the assessment.**
- **General Criteria will also form the basis for the General Requirements that will be utilized in establishing general technical requirements to be included in the potential bid invitation specifications.**



Scope of General Criteria

The General Criteria should cover the areas like as follows:

- Sustainability of the nuclear power programme
- Demand for power generation capacity
- Electrical grid characteristics
- Site characteristics
- Environmental impact
- Nuclear safety, regulatory framework and licensability
- Radiation protection
- Nuclear fuel cycle policy
- Nuclear waste management
- Safeguards
- Security, physical protection and emergency planning
- National participation, Industrial development and human resource development strategies
- Overall economics
- Financing

References for General Criteria

- **Common User Considerations (CUC) by Developing Countries for Future Nuclear Power Plants**
(An IAEA document to be published soon)
- **General parts of**
 - EPRI's Utility Requirements Document (URD),
 - European Utility Requirements (EUR).



Survey of NPP Designs

Identification of NPP Candidates

Information sources

- **IAEA status reports on NPP designs, e.g;**
 - *Status of advanced light water reactor designs 2004* (IAEA-TECDOC-1391)
 - *Status of innovative small and medium sized reactor designs 2005* (IAEA-TECDOC-1485)
- **Presentations in nuclear magazines and workshops/conferences;**
- **Direct contacts to vendors.**

Topics of Questionnaire to Vendors

- **NPP type, size and technical performance;**
- **NPP safety and licensing;**
- **Fuel cycle;**
- **Financing and contracting; and**
- **Others**

Assessment of Selected NPP Designs (Technology Assessment Studies)

Typical Contents and of Technology Assessment Studies

- **Comparison of the NPP design to the General Criteria to identify the significant differences;**
- **Preliminary assessment of NPP design aspects;**
- **Preliminary assessment of plant location at the site;**
- **Discussions with the Regulatory Body;**
- **Preliminary project implementation assessment covering also necessary infrastructure development and national participation;**
- **Survey of Vendor's capabilities;**
- **Cost estimates**



Summary Report on Technology Assessment Studies

The main results of all Technology Assessment Studies should be compiled by the Owner into a summary report covering topics such as:

- **Plant size range;**
- **Estimated dates of construction start and commissioning;**
- **NPP concepts meeting the national criteria and specifications in general and necessary design modifications to the concepts;**
- **Results of the supplier candidate survey;**
- **Needs for infrastructure development;**
- **Possibilities of national participation;**
- **Economics; and**
- **Financing options.**

NPP Deployment Strategy and Plan

NPP Deployment Strategy

- **Contracting strategy consistent with the existing and developing human and physical resources;**
- **Project management and human resources strategy consistent with the contracting strategy;**
- **Fuel supply strategy and a fuel supply plan consistent with the contracting strategy;**
- **Used fuel and radioactive waste management programme consistent with the contracting strategy;**
and
- **Financing strategy consistent with the contracting strategy.**

Short Term Deployment Plan

- **Preparation of the bid invitation specifications;**
- **Preparation of the bids;**
- **Bid evaluation ; and**
- **Contract negotiation and finalization.**

Organizing of a Technology Assessment

Organization and Human Resources for Technology Assessment

- **The Owner has the full responsibility for the Technology Assessment activities. The Owner can delegate certain tasks and obtain assistance, but he cannot delegate the general responsibility nor can he share it with anyone.**
- **The Owner has to establish an organizational unit which is in charge of the Technology Assessment and he has to select competent persons for this unit.**
- **The organizational unit should have direct access to the highest level of decision-making capability within the Owner's overall organization.**
- **The organizational unit should have easy access to outside expertise for assistance and advice in a wide range of special topics.**



Use of Consultants

- **It is generally advisable for the Owner to obtain assistance from well qualified consultants who have the experience and specialized knowledge that may be lacking in the Owner's team.**
- **Tasks given to consulting companies have to be defined carefully.**
- **Persons from consulting companies can be hired to the Owner's team for defined periods. They are managed like the employes of the Owner.**

Summary

- **Technology Assessment is a procedure**
 - **to compile and formulate the needs of the country (owner) in a systematic way,**
 - **to enhance the readiness to conduct a fair bidding process for the final selection of the NPP design,**
 - **to provide sound technical basis for the subsequent phases of the NPP deployment.**

- **Technology Assessment may take different forms in accordance with the status of nuclear power introduction and the local conditions in various countries.**



Thank you for your attention!