

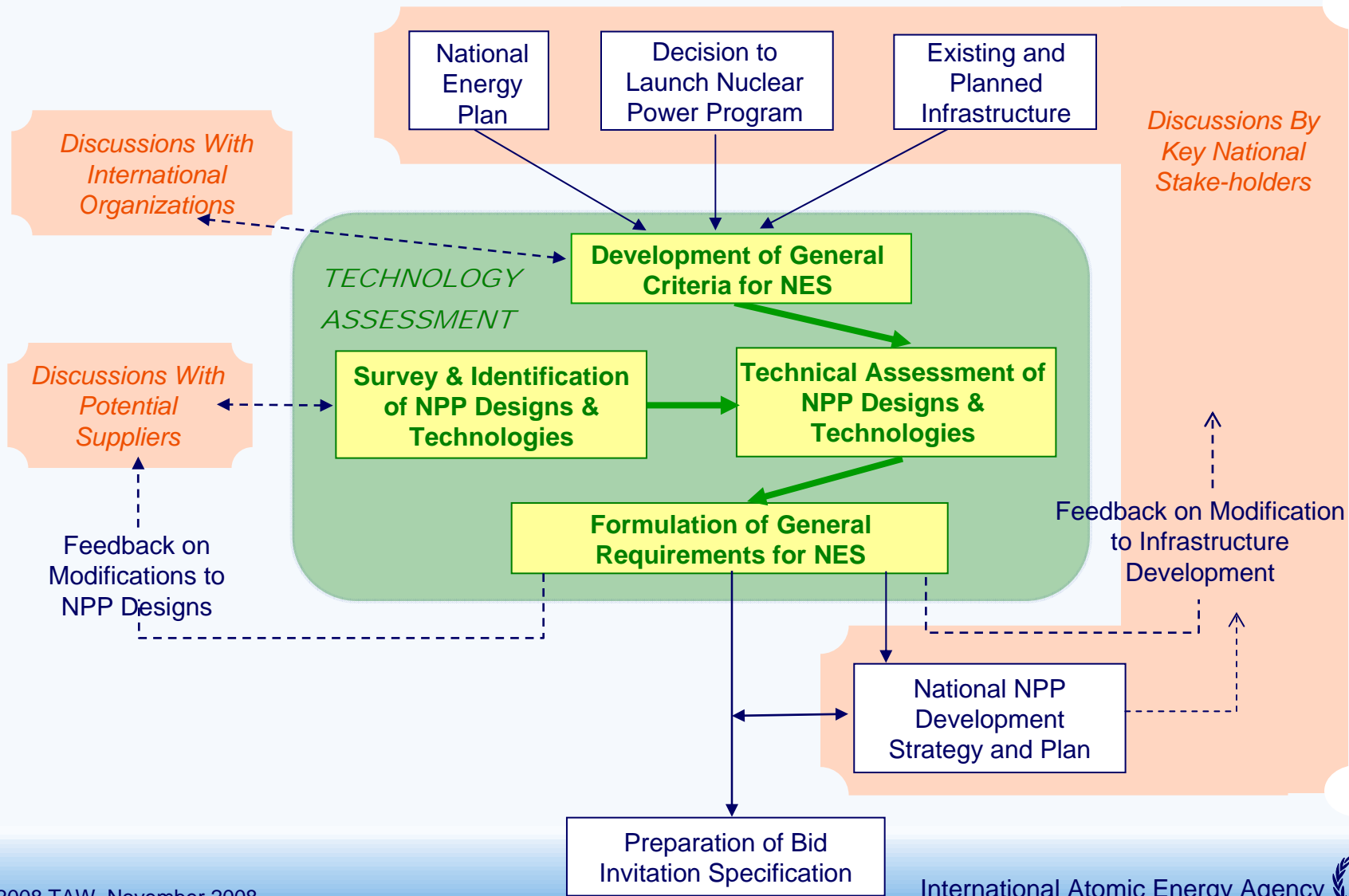
International Atomic Energy Agency

Integrated Process of Technology Assessment

**Ami Rastas
Consultant**

**Technical Cooperation Workshop on
Nuclear Power Plant Technology Assessment
Vienna, November 17-20, 2008**

Scope of Technology Assessment



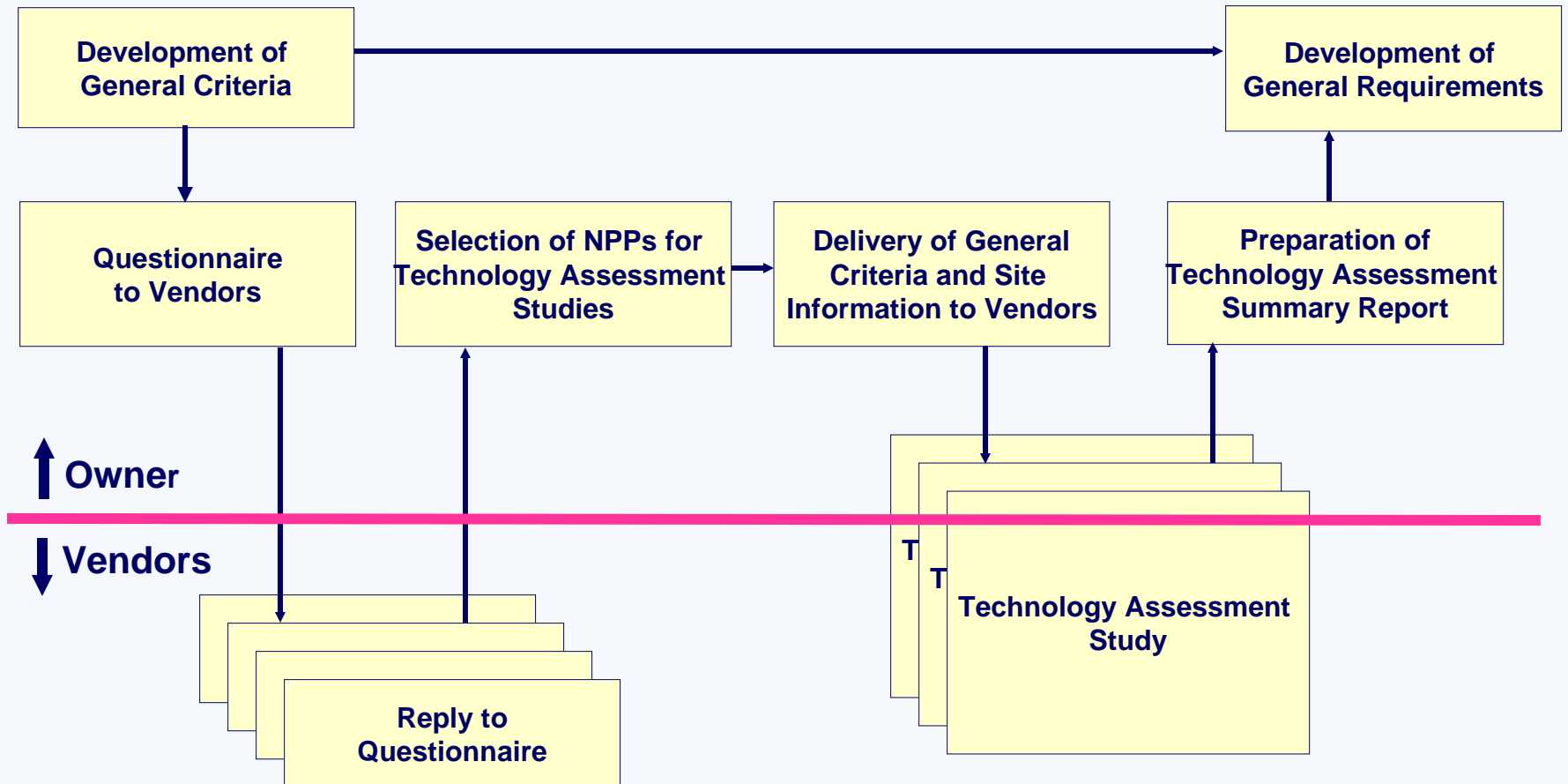
Main Activities of the Technology Assessment Process

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 (Technology Assessment Studies);**
- **Expansion of the General Criteria with additional details and its formulation into the General Requirements for NES.**



Example of Technology Assessment Process



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



Examples of Questions in Questionnaire (1/4)

Questions Related to NPP Design and Technical Performance

- **What standard unit sizes do you have in your portfolio?**
- **What are the attractive features of the design you offer, in terms of safety, economics, environment and waste, infrastructure and sustainability, considering the conditions in our country?**
- **How does the design comply with international standards and requirements such as URD and EUR?**
- **What are the main design targets of the proposed reactor?**
- **What operational experience and/or experimental validations do you have on the proposed design or on similar design?**



Examples of Questions in Questionnaire (2/4)

Questions Related to NPP Safety and Licensing NPP

- Which regulatory requirements do form the bases for the NPP design?
- Does the NPP design fulfil the IAEA Safety Standards?
- What are the licensing experiences of the NPP design?
- Which external events have taken into account in the NPP design?
- What specific design features does your design have to minimize the consequence of hypothetical severe accident?

Examples of Questions in Questionnaire (3/4)

Questions Related to Fuel Cycle

- **What fuel supply arrangements would you offer/require?**
- **Would you be willing to take-back spent fuel?**

Examples of Questions in Questionnaire (4/4))

Questions Related to Financing and Contracting

- **What type of financing terms you can offer?**
- **What kind of delivery contracts would you require/offer?**
- **Do you have any policy of cooperation for localization or technology transfer and experiences?**



Memorandum Of Understanding (MOU)

An MOU signed by the Owner and Vendor should cover items like:

- **Scope of the Technology Assessment Study;**
- **Coordination;**
- **Organization and resources;**
- **Cost sharing;**
- **Schedule;**
- **Rights;**
- **Proprietary information; and**
- **Liability.**

General 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**



Contents and **Deliverables** of Technology Assessment Studies

- Comparison of the NPP design to the General Criteria to identify the significant differences and define the modifications to be introduced to the original design; **“Design Comparison Report”**
- Analysis of the characteristics and the performance of the similar plants in order to identify problem areas; **“Plant References Report”**
- Discussions with the regulatory body; **“Licensability Report”**
- Preliminary assessment of plant location at the site; **“Plant Location Report”**
- Preliminary project implementation assessment covering contractual approach, project organization, time schedule, necessary infrastructure development and national participation; **“Project Implementation Report”**



Contents and **Deliverables** of Technology Assessment Studies (cont.)

- Preparation of a report describing the plant design including design modifications identified in the “Design Comparison Report”; **"NPP General Description"**
- Survey of Vendor’s capabilities; **"Vendor’s Capabilities Report"**
- Preparation of a summary report which will compile the main results of the study excluding cost information; **"Technology Assessment Study Report"**
- Preparation of a rough cost estimate for the construction of the NPP at the selected site. The Vendor may also describe his possible support for financing; **"Tentative Investment Cost and Financing Report"**
- Preparation of a rough estimate for levelized generation cost; **"Tentative Generation Cost Report"**



NPP Design Aspects to Be Assessed

- **Plant size and characteristics**
- **Proven technology and licensibility**
- **Standardization**
- **Simplification**
- **Constructability**
- **Operability and maneuverability**
- **Inspectability and maintainability**
- **Refueling cycle**
- **Plant Availability**
- **Plant life time**
- **Physical protection**
- **Decommissioning**
- **Capital, operation and maintenance cost**
- **Project schedule**
- **Degree of national participation**
- **Technology transfer and technical support**

Survey of Vendor's Capabilities

Factors to be considered:

- Recent experience on design and construction of the NPPs;
- Local experience;
- Liability coverage;
- Organizational structure;
- Quality management systems;
- R&D activities;
- Service capabilities; and
- Longevity expectations.

Cost Estimates

- It is assumed that the general economic studies conducted before a decision to launch a nuclear power programme have indicated that the economics of nuclear power is within the acceptable range for inclusion in the generation mix of the country.
- In connection with the Technology Assessment, a more detailed generation cost analysis of various NPP concepts should be carried out.
- Economic information for cost analysis should be obtained from all available sources, mainly Vendors and experienced operators of similar NPPs.
- Usually, a levelized generation cost calculation method is applied in connection with the Technology Assessment.
- The final and decisive investment and generation cost calculations will be carried out in the connection with the evaluation of the binding bids received later.



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 all NPP designs and 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.**

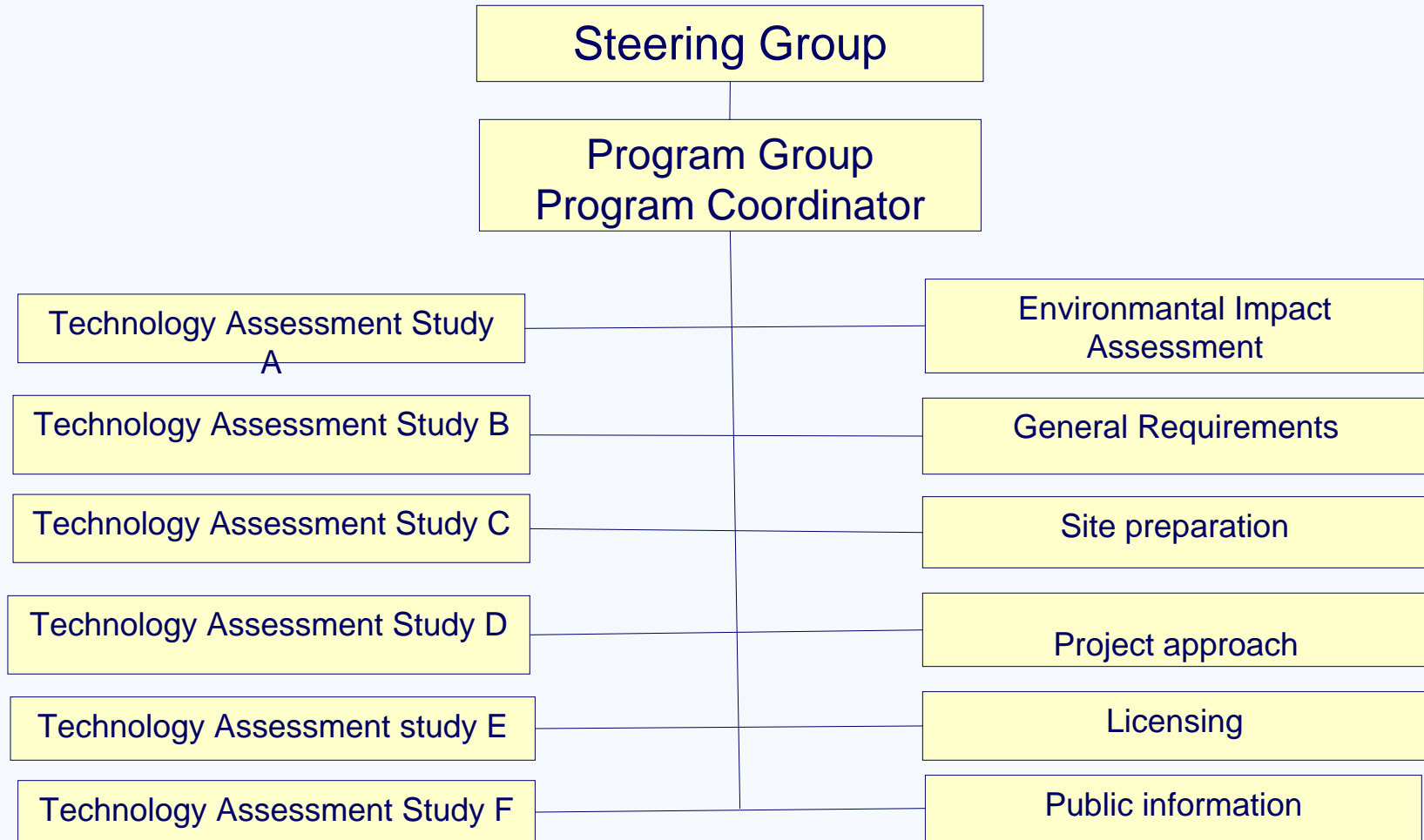


Organization and Human Resources for Technology Assessment

- **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 may 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.**



Preparedness Program



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.**



Selection of Consultants

The selection of consultants should be made with special consideration of the following points:

- Relevant experience in developing countries, preferably in the owner's country;
- Experience in the scope of the work;
- Reputation;
- Impartiality regarding prospective suppliers;
- Qualifications of the staff of the consultant; and
- Continuity in the staff from other NPP projects.



Cooperation between Owner and Vendors

- **A Technology Assessment Study could be governed by a Memorandum Of Understanding (MOU) signed by the Owner and the corresponding Vendor.**
- **Vendors should be treated on equal terms.**
- **Confidentiality aspects have to be respected.**
- **Vendors have to be informed about the overall status and future plans of the NPP programme.**
- **Contact persons have to be nominated by the Owner and by the Vendor.**
- **Regular coordination meetings should be arranged with each Vendor.**



Relationship between Owner, Regulatory Body and other Stakeholders

- It is necessary to establish a very close working relationship, based on mutual confidence without violating the basic principle of independence, between the Owner and the Regulatory Body from the very beginning of the Technology Assessment.
- Regarding the licensability of various NPP designs one recommended way is arrange trilateral meetings between the Owner, the Regulatory Body and the corresponding Vendor.
- It is necessary that all authorities which may be concerned with a later NPP implementation project are informed and have the possibility to express their points of view. One possibility is to arrange regularly high-level seminars on the progress of the Technology Assessment and other preparatory activities.



Potential Risks for the Success of Technology Assessment

- **Lack of vendors' interest to participate in Technology Assessment activities (Supplier's market situation); Protection:**
 - **sound and trustful programme for nuclear power introduction**
- **Lack of political and public support; Protection:**
 - **providing continuously information for key politicians and stakeholders**
 - **extensive public information and education programme**
- **Lack of expertise and human resources; Protection:**
 - **systematic human resource management program (training, staffing)**
 - **use of consultants**
- **Lack of financing; Protection:**
 - **sound financing plan covering all activities needed during the preparatory phases of nuclear power introduction program**



Thank you for your attention!