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Responsibilities and Capabilities of a Nuclear Energy Programme Implementing Organization

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RESPONSIBILITIES AND CAPABILITIES OF A NUCLEAR ENERGY PROGRAMME IMPLEMENTING ORGANIZATION

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FOREWORD

An appropriate infrastructure is essential for the efficient, safe, reliable and peaceful use of nuclear power. The IAEA was encouraged by its Member States to provide assistance to those considering the introduction of nuclear power. These countries face the challenge of building a national nuclear infrastructure to support a first nuclear power plant. The IAEA is responding to their needs through increased technical assistance, missions and workshops, and with new and updated technical publications in the IAEA Nuclear Energy Series.

Milestones in the Development of a National Infrastructure for Nuclear Power, an IAEA Nuclear Energy Series publication (NG-G-3.1), provides detailed guidance on a holistic approach to national nuclear infrastructure development, over three phases. Nineteen issues are identified in this guide, ranging from development of a government's national position on nuclear power to planning for procurement related to the first NPP. An important element of the holistic approach is an entity that can help prepare the decision makers in a country to make a knowledgeable commitment to nuclear power, and then to coordinate infrastructure development efforts among various implementing organizations so that they arrive at the point of readiness to issue a bid tender at the same time. In the Milestones guide, this entity is called a nuclear energy programme implementing organization (NEPIO).

As a growing number of Member States started to consider the nuclear power option, they asked for guidance from the IAEA on how to launch a nuclear power programme. In particular, Member States requested additional information on how to establish a NEPIO, especially in the earliest phases of a programme. This report has been prepared to provide information on the responsibilities and capabilities of a NEPIO, as well as to give an indication on how it relates to other key national organizations in the implementation of a nuclear power programme, such as the owner/operator and the regulator, and on how its functions change over the course of the phases.

The preparation of this report was based upon contributions from external experts. The IAEA wishes to acknowledge the assistance provided by the many contributors listed at the end of the report. W. Rasin (United States of America), drafted the original manuscript. The IAEA officer responsible for this publication was A. Starz, of the Division of Nuclear Power.

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CONTENTS

1. INTRODUCTION

1.1. BACKGROUND

The application of nuclear energy is a serious undertaking requiring long term commitment and dedicated effort. Simply building a nuclear power plant is insufficient to ensure that it will operate effectively and meet safety, security, safeguards and efficiency requirements; the necessary institutional, human and physical infrastructure to construct and operate a nuclear power plant must first be built.

The distinction between a nuclear power programme and a nuclear power plant project is made in IAEA Nuclear Energy Series No. NG-G-3.1, Milestones in the Development of a National Infrastructure for Nuclear Power [1]. Before a successful nuclear power plant can proceed, a nuclear power programme establishes the infrastructure necessary to support it during its entire life cycle, including planning, siting, construction, commissioning, operation, decommissioning, and spent fuel and waste management.

IAEA Nuclear Energy Series No. NG-G-3.1 describes three distinct phases of a nuclear power programme, each ending with a milestone:

— Phase 1: Considerations before a decision to launch a nuclear power programme is taken.
— Phase 2: Preparatory work for the construction of a nuclear power plant after a policy decision has been taken.
— Phase 3: Activities to implement a first nuclear power plant.

The three milestones are:

Milestone 1 — Ready to make a knowledgeable commitment to a nuclear programme.
Milestone 2 — Ready to invite bids for a first nuclear power plant.
Milestone 3 — Ready to commission and operate the first nuclear power plant.

A diagram describing these phases and milestones is provided in Annex 2.

This report describes the functions of the organization that will lead the way to achieving Milestones 1 and 2. IAEA Nuclear Energy Series No. NG-G-3.1 named such an organization a nuclear energy programme implementing organization (NEPIO). The name implies a role for the organization in the implementation of a nuclear power programme. The NEPIO may be charged with carrying out the implementation of a nuclear power programme or with activities that support implementation. Such activities may include preparing for a decision on implementing a nuclear power programme and coordinating the implementation among other entities or carrying it out itself. A country will have to determine for itself the level of responsibility assigned to a NEPIO. This report describes a generalized NEPIO and its functions to provide countries with information as they establish the entities that will help them carry out a national nuclear power programme. In some countries, an organization, such as an Atomic Energy Commission, may be assigned the responsibilities of a NEPIO and may fulfill the functions described in this report.

Responsibilities, leadership and oversight functions, as well as organizational and technical capabilities, are vital to the ultimate success of a nuclear power programme. The government should provide a NEPIO with the competent human resources and sufficient funding to carry out its mission. A NEPIO may be viewed as a transitory organization. If the decision is made to proceed with a nuclear power programme, specific areas of responsibility may shift from a NEPIO to other organizations such as the regulatory body (oversight function) and the owner/operator (implementation function). This transition would have to be carefully considered and prepared with a view to preventing any break in the effectiveness of process or in corporate memory.

The purpose of a NEPIO in Phase 1 is to compile the information necessary for a knowledgeable policy decision to proceed with the development of a nuclear power programme. During Phase 1, a NEPIO may conduct research and studies and make policy and strategy recommendations to the decisionmakers in government with respect to each of the 19 infrastructure issues identified in NG-G-3.1 [1]. A table of these issues

is provided in Annex 1. The implications and the approach to their resolution should be considered but not resolved by Milestone 1. It is the responsibility of the NEPIO to ensure that all 19 issues have been considered.

During Phase 2, a NEPIO ensures that the policies and strategies are translated into firm action plans for each of the 19 issues and that the corresponding responsibilities are assigned to the institutional organizations that will become a permanent part of the overall programme infrastructure. As these organizations assume their responsibilities, a NEPIO may assume a coordination role to ensure that the components of the overall programme are choreographed and proceed as envisioned according to schedule. If the infrastructure development is properly planned and carried out, a NEPIO, in its infrastructure development role, may disappear as Milestone 2 is achieved. Even so, a successor organization may be appropriate to continue to support and advocate in the government for the overall nuclear power programme, even after a first reactor is operational.

1.2. OBJECTIVE

This report provides a general description of the responsibilities and capabilities of a NEPIO in the development of the national nuclear power programme based on the Milestones infrastructure approach. It is not meant to be prescriptive. Rather, the organizational structures, the responsibilities and the competencies described may be useful in a knowledgeable, disciplined approach to developing a national nuclear power programme.

1.3. SCOPE

The scope of this report covers the responsibilities and capabilities for a NEPIO to successfully develop the knowledge, policies and strategies needed for making a knowledgeable decision to commit to a nuclear energy programme, and to coordinate and prepare the infrastructure development activities among a range of stakeholders.

1.4. USERS

This report is aimed at senior managers and advisors from the governmental organizations, utilities, industries and regulatory bodies of a Member State involved in initiating a first nuclear power plant. It will be of primary interest to the government and the NEPIO established to guide the overall development of a nuclear power programme

1.5. STRUCTURE

This report consists of five main sections in addition to the introduction. Section 2 discusses the government commitment and authority necessary for a NEPIO to fulfil its responsibilities. Section 3 presents the responsibilities and functions of a NEPIO during Phases 1 and 2 of nuclear power programme development. Section 4 deals with the structure of a NEPIO. Section 5 discusses the necessary competencies of a NEPIO. Finally, Section 6 presents a discussion of the anticipated life span of a NEPIO.

1.6. HOW TO USE THE REPORT

This report should be used as general guidance by Member States forming an organization to study, consider and/or pursue development of a national nuclear power programme. Neither this report nor the Milestones guide [1] is intended to provide a comprehensive description of the entire infrastructure needed for a nuclear power programme. A wealth of information and guidance on each of the infrastructure issues is

available, for example, from the IAEA publications listed in the bibliography included in the Milestones guide [1] and IAEA safety standards [2].

Other publications address the responsibilities and capabilities of organizations involved in the launching of a national nuclear power programme. For additional information on regulatory bodies, the IAEA Safety Standards Series should be consulted.

2. GOVERNMENT COMMITMENT

Through its normal economic and energy planning mechanisms, the government may have determined that nuclear power could be a viable component of its future energy and industry development. To understand the full commitment and potential feasibility of pursuing a nuclear power programme, it is important to have a realistic picture of the country's existing industrial and institutional infrastructure and knowledge of the required enhancement of that infrastructure for a long term commitment to nuclear power. A NEPIO may be formed to lead the effort to develop the understanding of the associated obligations and commitments.

The success of a NEPIO will depend on the strength of the government's commitment. It is recommended that the appointment of the NEPIO come from a high level in the government so that the strength of this commitment is obvious. The NEPIO should be clearly charged with its responsibilities and granted authority commensurate with them. The authority should include the ability to hire competent staff, to enlist the participation or cooperation of other government organizations and to employ consultants or advisors as necessary. Authorization of communication and interaction with international organizations such as the IAEA is encouraged. Periodic reporting to senior government officials should be encouraged to ensure that the strength of the government's commitment is maintained.

The strength of the government's commitment may be demonstrated by issuance of a charter or terms of reference for a NEPIO stating its authorities and responsibilities. A clear statement of the expected deliverables may be included. An approved allocation of resources should be made, including the authorization to expend the funds within the terms of the charter.

An official public announcement of the formation of the organization functioning as a NEPIO should be made so that all interested parties understand the government's intention to explore nuclear power. This announcement may also include the reasons behind such an intention. It should also clearly state the intention to consult interested stakeholders at appropriate times in the consideration and development of a nuclear power programme.

3. RESPONSIBILITIES AND FUNCTIONS OF A NEPIO

The overall responsibility of a NEPIO is to lead and manage the effort for consideration and subsequent development of a national nuclear power programme. During Phase 1, the NEPIO is responsible for compiling the information necessary for the government to make an informed decision on whether or not to proceed with the development of a nuclear power programme. If the government decides to proceed, the NEPIO may be assigned the responsibility during Phase 2 for coordinating the development of the necessary infrastructure among the various responsible parties — for example, government ministries, regulators and the designated owner/operator — to bring the country to a point of readiness to issue a bid for the first nuclear power plant project.

3.1. RESPONSIBILITIES AND FUNCTIONS IN PHASE 1

The starting point for developing a programme for the introduction of nuclear power is a complete understanding of the nation's energy needs and the alternative options available for meeting them. The starting conditions for NEPIO activities may vary depending on:

— The availability of competent people to initiate activities in this area;
— The thoroughness of the energy planning process;
— The existence of basic nuclear law;
— The existence of an established regulatory body;
— The experience with nuclear or radioactive material.

Depending on the degree of commitment of the government, the desired end point of the initial NEPIO activities could range from recommendations for strategy and policy decisions to firm plans and budgets for the nuclear power programme development and implementation. For the purpose of this report, the starting point for a NEPIO is assumed to be that a country has a good knowledge of its future energy needs and a desire to seriously consider including nuclear power as part of the overall strategy to meet them.

During Phase 1, a NEPIO would consider the 19 issues identified in NG-G-3.1 [1] and produce a comprehensive study clearly delineating the commitments and processes necessary to undertake a nuclear power programme. This comprehensive study should be backed up by a series of more detailed papers for individual or related groups of these issues. The papers may be considered as deliverables produced within an overall schedule consistent with the NEPIO Charter or Terms of Reference. The comprehensive study and detailed papers would be the products of the NEPIO. A nominal time frame of about 1–3 years may be planned for completing Phase 1. This time frame could be shorter or longer depending on the resources provided, the expertise available to the NEPIO and the end point that the NEPIO must achieve.

The NEPIO reports may recommend policies to be adopted by the government and strategies to implement them. Included in the strategies may be an estimate of the funding and the schedule required for implementation.

It is the function of the NEPIO during Phase 1 to reach the point described in Table 1 for each of the 19 issues of NG-G-3.1 [1] for Milestone 1. More detail on each issue is contained in that report. Additional information on the endpoint that a country should reach on completion of Phase 1 can be found in NG-T-3.2 [3]. The NEPIO will likely be involved in preparing the Government to reach many of the items listed.

The issues investigated by the NEPIO should be well documented. Further information on the kinds of documentation deemed useful can be found in Refs [3, 4]. For most issues, strategies need to be developed. Upon government decision to proceed with a nuclear power programme, these strategies could form the basis for the development of detailed plans in Phase 2. IAEA-TECDOC-1555, Managing the First Nuclear Power Plant [5], provides a description of a Nuclear Power Plant Planning Study that countries may find useful at this stage.

Countries may also find it useful to periodically evaluate the status of their infrastructure development activities. Conducting such an assessment upon the completion of each phase may be a means of ensuring countries that they are prepared to move forward. A methodology for conducting an evaluation, which includes a further description of the kinds of documentation that can support the deliverables described above, is provided in Ref. [3].

3.2. RESPONSIBILITIES AND FUNCTIONS IN PHASE 2

Phase 2 of the process of creating a nuclear power programme entails building sufficient national infrastructure to prepare the country for issuing a bid for the first nuclear power plant and establishing the organizations and institutions that will continue to develop it in Phase 3. While a NEPIO will remain the lead organization for some issues, by the time of reaching Milestone 2, most issues will have become the responsibility of permanent organizations such as the regulatory body and the owner/operator. These roles should be clearly delineated. However, the crucial role of continued coordination of the development of the

TABLE 1. FUNCTIONS OF A NEPIO IN PHASE 1

National position	Provide a recommendation for a national decision to undertake (or not undertake) a nuclear power programme based on a comprehensive understanding of the long term commitments inherent in such a programme. This recommendation should be supported by a comprehensive report covering all areas identified in NG-G-3.1 [1] and recognizing the resources and time scales required for the activities to implement Phase 2.
Nuclear safety	Convey the importance of clearly recognizing that long term safety is a vital component of all activities associated with the design, manufacture, construction, operation and maintenance of a nuclear facility, decommissioning and commitments for spent fuel and waste management and that it is best achieved by fostering a strong safety culture in all organizations involved.
Management	Provide a clear description of the scope and depth of management expertise needed within each organization associated with the nuclear energy programme and a strategy to obtain or develop that expertise. Define the form of the potential owner/operator organization and assist in building its capabilities. Make suggestions for allocations on specific responsibilities of each organization associated with the nuclear power programme.
Funding and financing[a]	Design a strategy for funding the development of relevant public institutional organizations (such as the regulatory body) and financing specific nuclear power plant projects, including decommissioning and waste management. The strategy may also include government funding in support of the nuclear power plant project itself, including public financing.
Legislative framework	Identify all legislation, including international legal instruments, required to be implemented or enhanced to support a nuclear power programme and a strategy for drafting and enacting it.
Safeguards	Provide a plan covering the conclusion of a comprehensive safeguards agreement (CSA) with the IAEA and the establishment of a State system for accounting of and control of nuclear material (SSAC) with the requisite authorities. Provide a plan covering the drafting, implementing and enforcement of national legislation, policies and procedures relevant to safeguards.
Regulatory framework	Define the fundamental elements of an independent and effective nuclear regulatory body and a strategy to create or enhance, fund and staff it.
Radiation protection	Define the fundamental elements of a comprehensive radiation protection programme for all nuclear activities and a strategy for implementing them within each organization.
Electrical grid	Provide a comprehensive description of the grid size, configuration and reliability necessary to accommodate the addition of an nuclear power plant and the likely extent and cost of grid enhancements that will be needed.
Human resource development	Describe the knowledge, skills and attitudes of multiple disciplines required for a nuclear power programme and a strategy for obtaining and maintaining the needed personnel.
Stakeholder involvement	Conduct surveys of opinions on the application of nuclear power within the country and plans for ongoing education and consultation with identified stakeholders.
Site and supporting facilities	Identify potential sites and a preliminary assessment of their suitability for nuclear facilities' construction and operation.
Environmental protection	Assess the additional environmental considerations necessary for nuclear power, assessment of existing environmental laws and regulations, and a strategy for their appropriate revision.

TABLE 1. FUNCTIONS OF A NEPIO IN PHASE 1 (cont.)

Emergency planning	Describe the fundamental elements of emergency planning for nuclear facilities and the individual role of each institution and organization.
Security and physical protection	Describe the fundamental elements of security and physical protection programmes, and provide a development strategy for these programmes.
Nuclear fuel cycle	Develop an understanding of the long term nuclear fuel cycle commitments necessary for completing realistic nuclear fuel cycle plans in Phase 2. Develop a strategy for obtaining a secure supply of fuel and the appropriate national involvement in the individual steps of the nuclear fuel cycle, including availability of natural resources, interim storage of spent fuel and longer term storage of spent fuel, taking into account various fuel cycle options.
Radioactive waste	Conduct an assessment of current capabilities for the handling and disposal of low and intermediate level waste, a strategy for handling the additional volume associated with nuclear facility operation and a strategy for determining the approach to the ultimate disposal of high level nuclear waste or spent fuel.
Industrial involvement	Conduct an assessment of local industrial capability and a strategy for developing the desired degree of localization of industrial involvement or support for the planned nuclear power plant projects.
Procurement	Design a strategy for procuring the equipment and services to support a nuclear power plant project, taking into account the need for bilateral agreements with foreign suppliers and quality requirements for both international and local suppliers.

[a] Funding is considered to be financial resources provided without recourse, usually by the government. Financing is commercially provided.

comprehensive infrastructure among the various permanent organizations may still be performed by a NEPIO. Continued government support and funding remain vital to success.

The function of a NEPIO in Phase 2 is to continue focusing attention on the 19 issues in NG-G-3.1. The specific functions for these issues are summarized in Table 2.

Countries are encouraged to invite a peer review of their self-evaluation regarding the status of infrastructure development before reaching Milestone 2, issuing an invitation for bids. The IAEA provides assistance to Member States for conducting them as described in Ref. [3].

3.3. RESPONSIBILITIES AND FUNCTIONS BEYOND PHASE 2

By the time the country reaches Milestone 2 in the development of a nuclear power programme, the functions and responsibilities for many, if not all aspects of the programme may have been assigned to permanent organizations or institutions within the country. At that point, the NEPIO may have successfully fulfilled its functions for coordinating infrastructure development. Subsequently, a government may decide to discontinue the NEPIO or to assign it an ongoing promotional role in coordination and oversight of the nuclear power programme, either as a free-standing entity or incorporated into another organization.

TABLE 2. FUNCTIONS OF THE NEPIO IN PHASE 2

National position	Coordinate the government activities, inter alia, to implement the necessary laws and international agreements, to establish policies and responsibilities for the long term issues and the independent regulatory body, and to continue to fund and support the nuclear infrastructure development. Coordinate technology strategy development and its implications among impacted organizations.
Nuclear safety	Work to ensure that the responsibilities for nuclear safety are clearly established in law and that all participating organizations are aware of their safety responsibilities and foster establishment of an appropriate culture and activities in all involved organizations.
Management	Coordinate promotional, operational, oversight and support activities and monitor the creation and staffing of the independent regulatory body; and of the owner/operator organization, and the readiness to prepare for bids and licensing procedures.
Funding and financing	Work with the government to encourage adequate funding for infrastructure development and with the government and the owner/operator to develop a realistic financing plan for the first nuclear power plant.
Legislative framework	Monitor the country's process for implementing a comprehensive legal framework.
Safeguards	Confirm that a CSA with associated subsidiary arrangements is in force with the IAEA.[a] Confirm that an SSAC has been established and that early safeguards relevant information has been provided to the IAEA.
Regulatory framework	Confirm that the independent regulatory body is established and staffed, has developed a licensing process including appropriate regulations, codes and standards, and is prepared to review and license sites and reactor designs.
Radiation protection	Confirm the development and implementation of applicable laws, regulations and programmes by the government, the regulatory body and the owner/operator of formal radiation protection programmes.
Electrical grid	Confirm the development of necessary plans, schedules and funding of grid enhancements by the grid owner and/or the owner/operator to accommodate the addition of an nuclear power plant.
Human resource development	Confirm that all organizations have obtained the human resources necessary to carry out their functions at Milestone 2 and that programmes and plans are in place to develop, retain and replace human resources consistent with the country's plans for construction, operation, maintenance and support of the future nuclear power plant and associated nuclear activities.
Stakeholder involvement	Confirm that the government, the regulatory body and the owner/operator have developed and are implementing programmes for public education and stakeholder involvement at all appropriate steps in the nuclear power programme development process.
Site and supporting facilities	Confirm that the owner/operator has identified, secured and characterized one or more suitable sites and that the site characteristics are included in the bid specifications.
Environmental protection	Confirm that enhancements to environmental law have been made and the responsibilities for environmental approval and oversight have been formally assigned.
Emergency planning	Confirm that the government has enacted the necessary laws, that the regulatory body has developed regulations and that the owner/operator is developing the appropriate emergency plans and protocols with local and national authorities.

TABLE 2. FUNCTIONS OF THE NEPIO IN PHASE 2 (cont.)

Security and physical protection	Confirm that the appropriate laws, regulations, protocols and programmes have been established by the government, regulatory body and owner/operator for the security and protection of all nuclear materials and facilities.
Nuclear fuel cycle	Confirm that nuclear fuel cycle planning and strategy covers both the front and back ends of the fuel cycle, including the strategies for a secure supply of nuclear fuel and fuel services, and for on-site spent fuel storage capacity have been developed and are reflected in the owner/operator nuclear power plant bid request. Confirm the existence of an integrated plan for bidding and constructing fuel cycle facilities consistent with the power plant construction programme and national non-proliferation commitments.
Radioactive waste	Confirm that the appropriate laws, regulations and facilities are in place or planned for handling, transporting and storing low level waste (LLW) and intermediate level waste (ILW). In addition, assist the government in developing strategies and policies with respect to eventual disposal of high level waste (HLW) and spent fuel.
Industrial involvement	Confirm that the owner/operator, the regulatory body and designated industries are cooperating in developing the industrial involvement envisioned by the country's policies developed in Phase 1.
Procurement	Confirm that the owner/operator has developed formal plans for procurement of the equipment and services to support nuclear power plant operation and maintenance consistent with the country's policies developed in Phase 1.

[a] The IAEA encourages all States with a CSA to conclude the additional protocol.

4. STRUCTURE OF A NEPIO

There are many ways to structure a NEPIO; each way could result in a successful organization. What is important is that the organization accommodates the 19 issues and has clear interfaces with the various stakeholders.

Examples of NEPIO structures are given in NG-G-3.1 [1] and in IAEA-TECDOC-1513, Basic Infrastructure for a Nuclear Power Project [4]. In some cases, the NEPIO is given a different name: a nuclear power implementation agency (NPIA).

Figure 1 shows an example of a possible NEPIO organizational structure. It is recommended that the director of the NEPIO and the leadership of each of the major areas be indigenous to the country, if possible, in order to fully take into account the cultural norms, governmental structure and national views regarding the planning. Having indigenous leadership may also contribute to building confidence among the general public around the decision making and planning for a nuclear power programme. Staff seconded from other national organizations such as the ministries of energy, industry and the environment, and representatives from industry and the utility is also recommended. If an owner/operator organization is identified in Phase 1, it should also participate in the NEPIO. Many of the NEPIO staff members may move into positions of responsibility in other organizations as the country proceeds to build the full infrastructure. The use of consultants as experts to help understand and develop policy recommendations on the issues is strongly encouraged. In choosing consultants, programmatic implementation experience should be considered in addition to technical expertise.

As the country proceeds through Phase 2, the structure of the NEPIO may change. For example, with the establishment or enhancement of the independent regulatory body, NEPIO's role may evolve to that of monitoring progress rather than establishing regulatory policy. Similarly, the owner/operator will assume responsibility for many of the actions leading to the satisfaction of Milestone 2 and the implementation of an actual nuclear power plant project, while the NEPIO will monitor progress and provide coordination as needed.

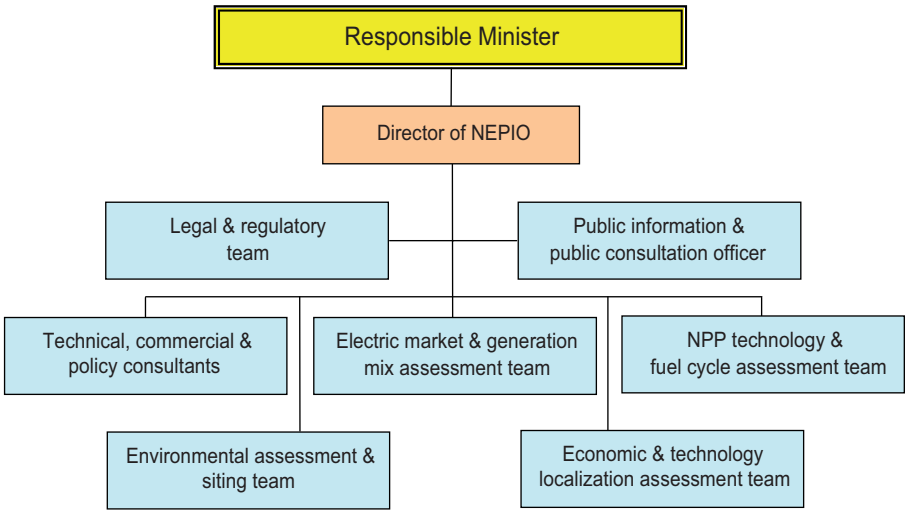

FIG. 1. Example of a possible NEPIO structure in Phase 1.

The project structure should be flexible enough to accommodate the transfer of responsibility of the NEPIO to the permanent organizations. Most importantly, during Phase 2, the NEPIO's role may be to retain government support and funding for the infrastructure development so that it remains strong and constant.

5. CAPABILITIES OF A NEPIO

To successfully accomplish its responsibilities, it is recommended that a NEPIO be staffed with individuals capable of exploring and understanding the 19 infrastructure issues. As the programme consideration and development proceeds through Phases 1 and 2, the composition of the NEPIO is likely to change. These changes would reflect the shift from policy development to firm planning, as well as the shift of responsibilities from the NEPIO to implementing institutions or organizations. It is noted that the main implementing institution for the nuclear power plant project is the owner/operator. The use of consultants and interactions with international experts and organizations are strongly encouraged, especially in areas where domestic expertise may not be available. However, the leadership and decision making should remain with national authorities.

Many of the capabilities may come from within government or other organizations, through seconded personnel to the NEPIO or some other arrangement. These personnel may return to their home organizations at the completion of Phase 1 and as the implementing functions begin in earnest in Phase 2, especially those of the owner/operator organization.. Figure 2 illustrates the kinds of organizations that may contribute expertise or capabilities to a NEPIO in Phase 1 and the absorption of the capabilities of the NEPIO into implementing organizations in Phase 2.

Of paramount importance is the role of the NEPIO director. The director needs broad knowledge of the national culture, the government structure, the current industrial and economic status and the economic development goals for the nation. Together with a general knowledge of nuclear power and associated legal and technical aspects, the director should demonstrate the ability to acquire respect and trust within the government and industry and among the public.

A manager, preferably a national, should be chosen for each major subject area identified. Figure 1 provides a suggestion about how subjects may be grouped, and all 19 issues should be covered in one or more teams. Broad knowledge of the issues should be developed through personal experience or through the liberal use of consultants. Programmatic implementation experience is an important consideration. Ideally, where there

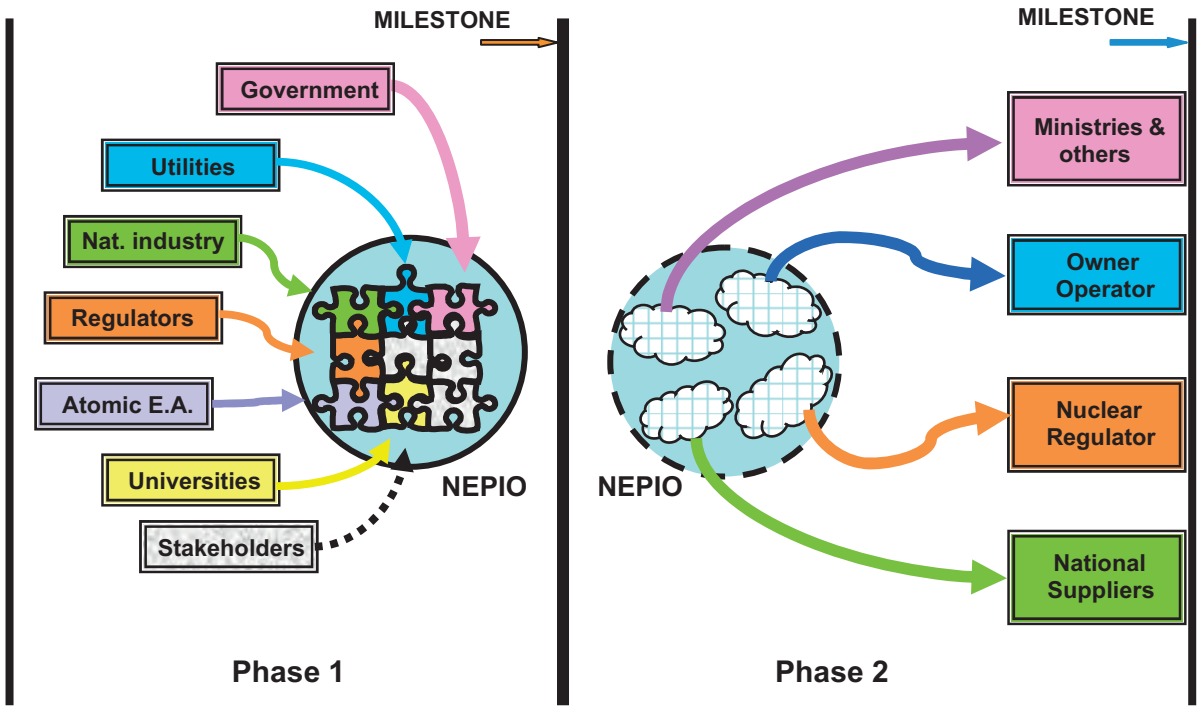

FIG. 2. Buildup of a NEPIO in Phase 1 and absorption into other organizations in Phase 2.

is expertise within other government or industry organizations within the country, experts should be assigned to work with the NEPIO. Their efforts should be under direction of the NEPIO director.

Energy policy and planning expertise should be familiar with the financial structure of the country's energy systems, the possible funding avenues available to the country, the government funding mechanisms for infrastructure development and support, the technical requirements for the grid, and the national industries that may be included to participate in the nuclear power programme. Knowledge of the electrical grid and expected or planned growth is also useful. Grid stability and reliability are particularly needed for nuclear applications. Such expertise may come from the utility, electricity grid owner/operator, electricity regulator and other places. Consultants with expertise in particular areas should be included where local expertise may not be available.

For the legal and regulatory framework, expertise needed includes familiarity with the legislative process of the country and the structure of the government ministries. It is recommended that analysis, exchange of information and consultation be conducted with international organizations and networks of regulators so that a comprehensive legal and regulatory framework can be developed taking into account relevant international legal instruments and IAEA safety standards [2]. A thorough understanding of regulatory approaches to be adopted and of regulatory functions and processes should be achieved. Legislative assistance from the IAEA may be requested. Frameworks for legal and regulatory programmes are becoming much more harmonized in the international nuclear community. Harmonization with international approaches will greatly facilitate international cooperation including the potential acceptance of regulatory reviews and approvals granted by a regulatory body in the vendor country.

Leadership expertise for involving stakeholders must have knowledge of national culture and processes. While consultant expertise to carry out public surveys and educational programme development can be useful, the proper development requires knowledge of the country and its people.

Human resources expertise should include educational and academic professionals familiar with the educational requirements for general engineering, technical and trade specialties. Knowledge of universities or training academies within the country is necessary. Consultants can be employed to bring the special educational requirements for nuclear technology. This expertise will facilitate the development of policies for educational opportunities either within the country or at foreign universities or institutions.

Expertise in nuclear technology is necessary to understand the nuclear fuel cycle and the nuclear technology options available from nuclear vendors. Specialized knowledge in site requirements for nuclear power plants is also needed. Consultants from nuclear vendors or architect-engineering companies can be particularly useful as indigenous expertise is developed.

The number of personnel needed to fulfill these capabilities is expected to vary from country to country due to national conditions, although an indication of the basic human resources needed to start would be at least 8–10 professionals [4], in addition to consultants as needed.

6. LIFE SPAN OF A NEPIO

A NEPIO should be viewed as a preparatory body that should ideally meld into the institutions and organizations that will be responsible for the proper conduct of a nuclear power programme. During Phase 1 of nuclear infrastructure development, a NEPIO should be the lead organization guiding the country to Milestone 1. It has an important responsibility to define the commitments and requirements necessary to employ an effective, safe, secure and peaceful nuclear power programme. Equally important, during Phase 2, it should have the responsibility to see that commitments and functions are assumed by the designated organizations. It is likely that the staff of the NEPIO may become heads of the respective institutions and organizations designated to support and implement the first and subsequent NPP projects, the two most significant being the owner/operator and regulatory organizations.

A NEPIO has a promotional role in forming the infrastructure and championing the use of nuclear technology as Milestone 1 is achieved. Continuing promotion and championing of the nuclear power programme is important since the permanent institutions are formed early in Phase 2. As Milestone 2 is achieved, a promotional role may be assigned to the Ministry of Energy or Industry so that the nuclear power programme continues to receive adequate support and funding from the government, including policy and programme development for high level radioactive waste disposition and for maintaining international commitments. The independent regulatory bodies will assume their full duties as Milestone 2 is reached and, at that point, are likely to be free of formal ties to the NEPIO. The owner/operator organization will assume full responsibility for the first nuclear power plant project and continue to be a main driver for an effective and safe national nuclear power programme.

If the infrastructure development process is carried forward in a complete manner, the responsibilities of the NEPIO will be fulfilled as Milestone 2 is achieved. Then, the NEPIO will have fulfilled its charter and may be disbanded. However, it is important for the oversight and coordination activities to continue. The oversight and coordination roles should be specifically assigned to appropriate government agencies prior to disbanding the NEPIO.

Appendix I

INFRASTRUCTURE ISSUES

The issues below are identified in the Milestones guide [1] as those to be considered by a NEPIO.

TABLE 1. INFRASTRUCTURE ISSUES AND MILESTONES

Issues	Milestone 1	Milestone 2	Milestone 3
National position			
Nuclear safety			
Management			
Funding and financing	Conditions	Conditions	Conditions
Legislative framework			
Safeguards			
Regulatory framework			
Radiation protection			
Electrical grid			
Human resources development			
Stakeholder involvement			
Site and supporting facilities			
Environmental protection			
Emergency planning			
Security and physical protection			
Nuclear fuel cycle			
Radioactive waste			
Industrial involvement			
Procurement			

Appendix II

INFRASTRUCTURE PHASES AND MILESTONES

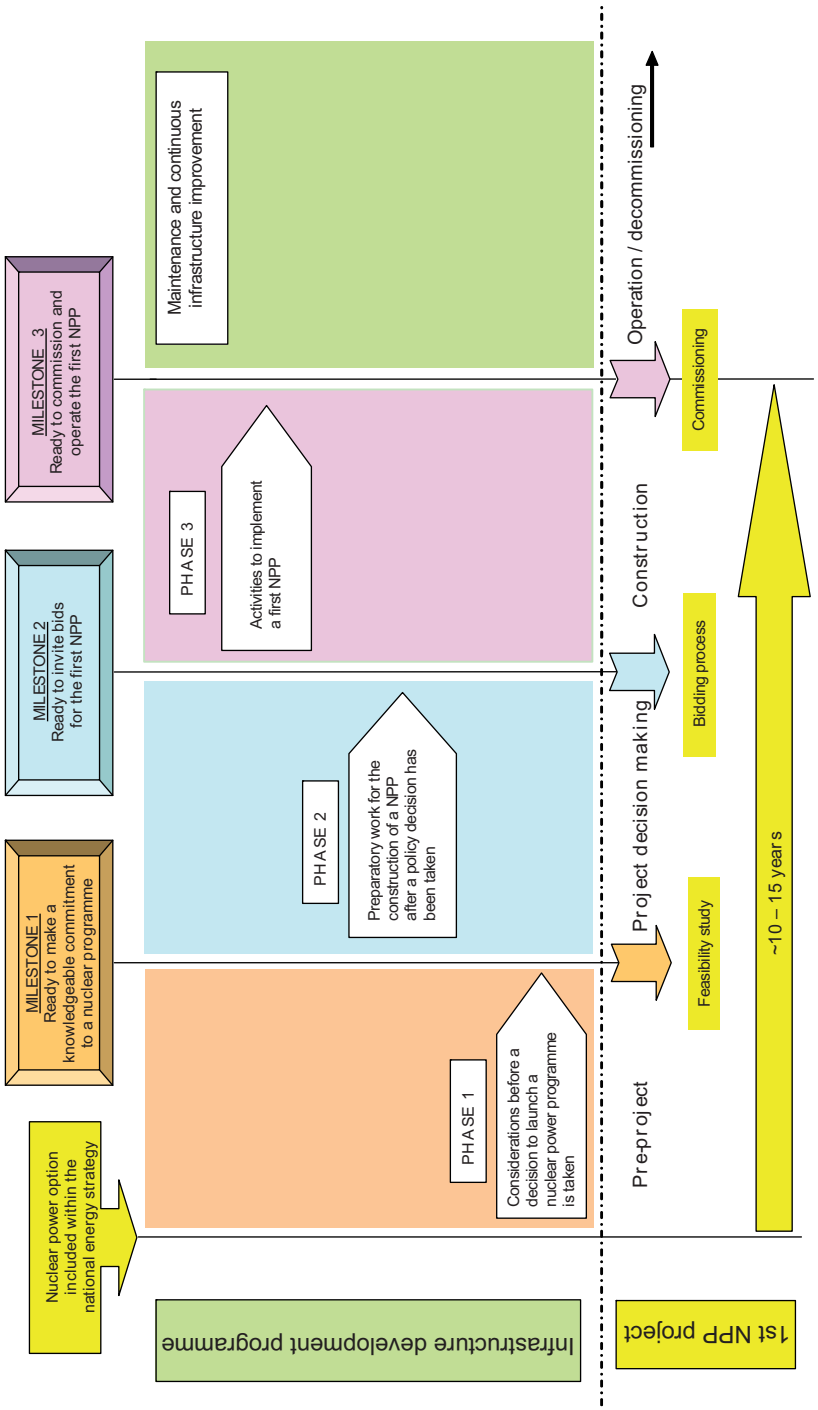

FIG. 3. The Milestones guide [1] indicates that a NEPIO's main functions would be in Phases 1 and 2, as illustrated.

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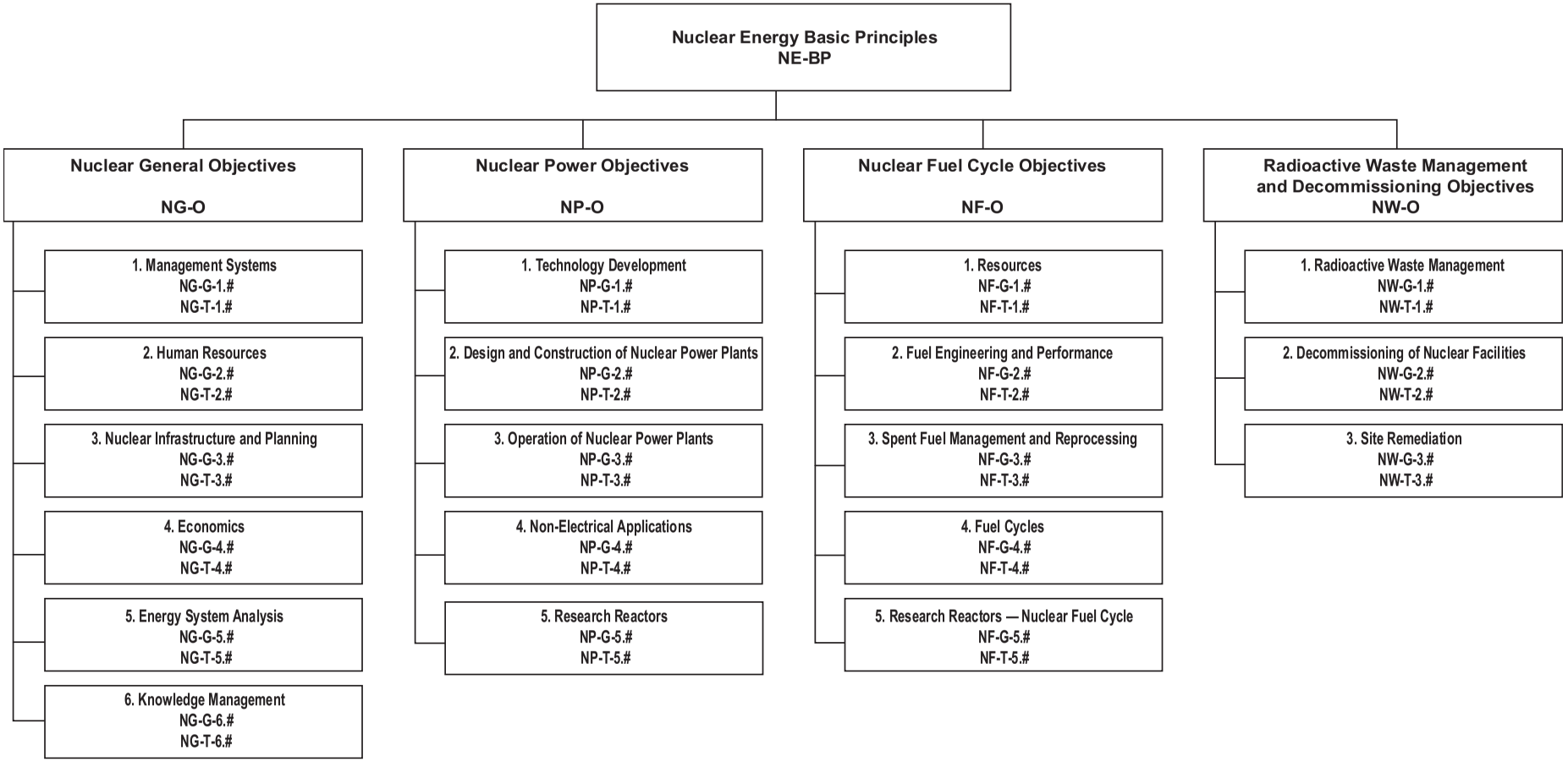

Key

BP: Basic Principles
O: Objectives
G: Guides
T: Technical Reports
Nos. 1-6: Topic designations
#: Guide or Report number (1, 2, 3, 4, etc.)

Examples

NG-G-3.1: Nuclear General (**NG**), **G**uide, Nuclear Infrastructure and Planning (topic **3**), **#1**
NP-T-5.4: Nuclear Power (**NP**), Report (**T**), Research Reactors (topic **5**), **#4**
NF-T-3.6: Nuclear Fuel (**NF**), Report (**T**), Spent Fuel Management and Reprocessing, **#6**
NW-G-1.1: Radioactive Waste Management and Decommissioning (**NW**), **G**uide, Radioactive Waste (topic **1**), **#1**

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