Fermi Conceptual Statement of Human Resources Development Strategy

Business Area - Generation

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1.0	-	New document

1. Introduction

Should Estonia embark on the Nuclear Power Program deploying 21st century nuclear technology to achieve its climate related goals and secure a future energy supply, it is essential that adequate knowledge and competences are in place along with the necessary regulatory and operating organizations. How this can be achieved is described in the Human Resource Development Strategy which forms an important part of a Nuclear Power Programme.

The nuclear industry demands a high level of competence from its employees due to the complexity involved and the level of safety required. This implies requirements on skills and certain unique competences that are needed to conduct a Nuclear Power Programme but overall, it requires a dedication to *Safety (both nuclear and industrial)* and *Security* throughout the Nuclear Power Programme.

This means that *Safety* and *Security* must be considered in all activities throughout the Nuclear Power Programme, and that is especially true when it comes to select and train the staff needed. Reaching the goal of safe operation of the nuclear power plant is ultimately achieved by building a sound nuclear safety culture throughout the Nuclear Power Programme.

2. Human Resource Development Strategy

The goal of the Human Resource Development Strategy is to create and implement a strategy and plan for how to ensure that the necessary competence is available when needed and form a basis upon which a sound nuclear safety culture can be built. The Human Resource Development Strategy will contribute to the overall goal with an efficiently executed Nuclear Power Program with a safe and secure operation of the nuclear power plant.

The International Atomic Energy Agency (IAEA) describes a process of creating a Human Resource Development Strategy as part of their milestones approach for a Nuclear Power Programme [1]. The milestone approach divides the development of a Nuclear Power Programme in three main phases as shown in Figure 1.

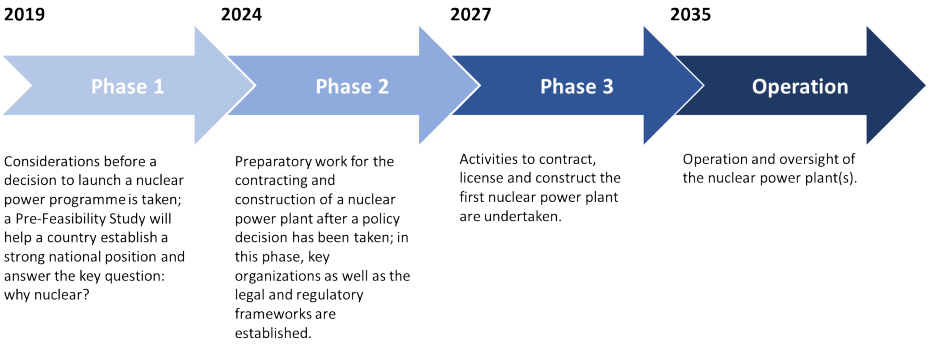

Figure 1 The IAEA has created a process which divides the development of a Nuclear Power Programme in three main phases, each ending in a milestone that require that a certain status has to be reached in the programme before entering the next phase.

Conducting a Nuclear Power Programme in Estonia will require that three organizations or actors are in place, each playing a vital role in achieving the overall goal of producing nuclear electricity in a safe and economic way. These actors are:

- *Government Nuclear Implementation Organization (Government)*, responsible for national policies and forming the Nuclear Regulator
- *Nuclear Regulator*, responsible for creating the regulatory framework, review applications and carrying out inspections during construction and operation phase.
- *Nuclear Power Plant Operator (Owner)*, responsible for the construction and operation of the nuclear power plant

The Human Resource Development Strategy covers the need and supply of competences for all these three actors. However, the detailed plans and executions will be the responsibility of each actor, once they are in place, see Figure 2.

The Human Resource Development Strategy consists of four main elements:

- Conceptual statement (this document)
- Human resource strategy
- Workforce plan
- Personnel selection

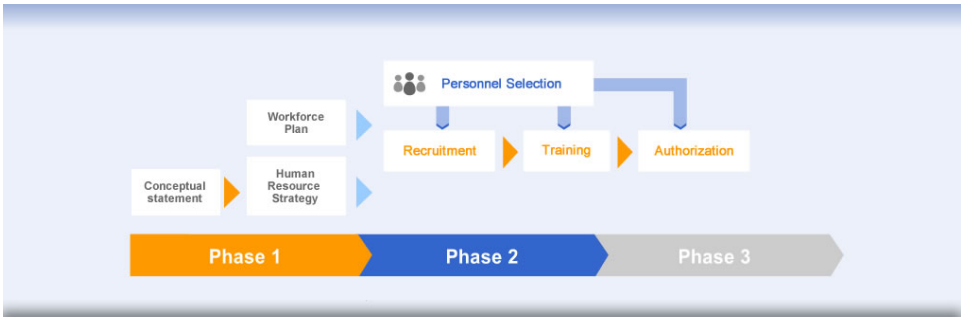

Figure 2 The process of creating an organization (actor) to build and operate a nuclear power plant starts in the first phase of the nuclear programme with a conceptual statement and development of a Human resource strategy and a Workforce plan.

The start of the Human Resource Development Strategy is the Conceptual statement which is this document. It defines the purpose of the Human Resource Development Strategy along with the main activities. It also sets the overall strategies considering sourcing of personnel and the long-term competence supply. These strategies are then developed into a Human resource strategy and a Workforce plan. Both these documents will be continuously developed during phase 1 in the Nuclear Power Programme.

The *Human resource strategy* addresses the capabilities of the nations educational system, societal acceptance and necessary resources to develop and sustain the competences. The *Human resource strategy* is cross functional in that aspect that it has an impact on all other areas in a Nuclear Power Programme. IAEA describes a total of 19 main areas in their Milestones Approach [1] and all of them will be affected both in planning and execution by the *Human resource strategy.*

The Workforce plan is a systematic identification and analysis of what each actor and the country will need in terms of size and competence of the workforce.

The *Human resource strategy* and the *Workforce plan* are then implemented in the personnel selection process that covers all stages from recruiting, training and finally authorize the staff needed for the Nuclear Power Programme.

2.1. Human Resource Strategy

Carrying out a programme to construct and operate a nuclear power plant requires on one hand certain expertise that is unique to the nuclear industry such as nuclear physics and reactor core design. On the other hand, many of the skills necessary for the construction of a nuclear power plant can be found outside the nuclear industry. For many of these competences only a shorter nuclear specific training is sufficient to achieve the knowledge needed for working in a Nuclear Power Programme.

Common for all competences though is the required dedication to safety and nuclear safety. This is manifested through a sound nuclear safety culture.

A way of describing the different levels of nuclear competence needed in a Nuclear Power Programme and the number of staff required for each level is described in Figure 3.

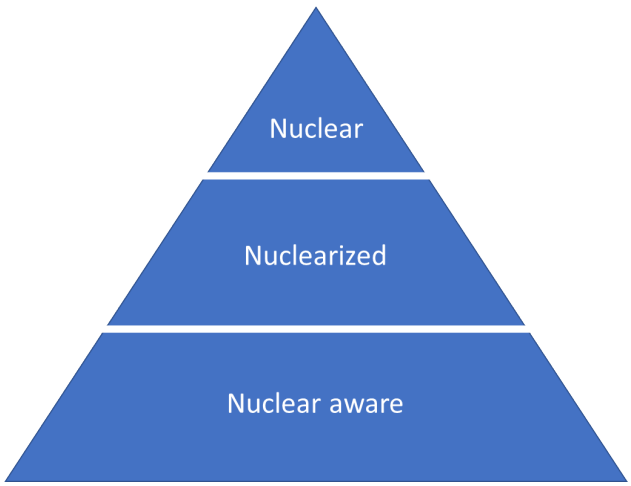

Figure 3 The competences needed in a Nuclear programme can be divided in three categories [2]: Nuclear, those with a deep and specific academic competence in nuclear such as core design; Nuclearized those who will receive a longer training such as plant operation personnel and finally Nuclear aware, those who only need shorter training which includes most on site staff that are not directly involved in operation of the plant. The figure also illustrates the number of staffing estimated in each category, the largest number expected for the Nuclear aware and the smallest number in the Nuclear category.

The long-term goal for Estonia is to develop national expertise to fulfil the staffing need in all three categories for the involved actors.

During the Nuclear Power Programme, it is envisaged that the staffing needs for the competences that fits in the *Nuclear aware* category can be sourced in Estonia. Examples of competences within this category are automation, mechanical and civil engineering as well as Human Resources, public affairs and communication. Together they make up for the largest part of the staffing. They only need shorter training, but they do need to actively participate in building a strong safety culture. Generally, there is no need for a long-term strategy regarding the sourcing of competences that falls in this category since they are readily available in Estonia.

In the *Nuclearized* category competences such as operational personnel, maintenance personnel and plant system engineers can be found, but also quality management and licensing. The sourcing of these competences requires more planning since competences in this category needs longer specific training. The skills and competence in this category can be achieved through training or work experience, typically a combination of both. For example, the vendor will be responsible for the initial training of the plant system engineers but they will gain a lot of their knowledge over time by working at the nuclear power plant. The sourcing strategy for the competences in the *Nuclearized* category can both be training abroad of Estonian staff or bringing foreign experts to Estonia to directly train Estonian staff or spread their competence by “on the job training”. It is foreseen that it will be possible to source most of the necessary personnel in this category in Estonia. External resources (mainly experts) are required during the first phases of the program and the number of Estonian expertise will grow over time.

Finally, competences in the *Nuclear* category typically requires academic education that is nuclear specific (e.g. nuclear chemistry). In many cases a deep experience and knowledge is also needed. These competences do not exist in Estonia and while it is possible to form educational programmes for these competences, the staffing demand from the domestic nuclear industry in Estonia is not foreseen to be large enough to sustain national educational programmes, at least not in the short perspective. Instead sending Estonian students abroad in collaboration programs with foreign universities is considered a viable strategy. This requires a long-term commitment from Estonia to send students abroad to ensure the competence supply in the *Nuclear* category.

To achieve the long-term goal of national expertise in all three categories, it is necessary to establish and maintain close relationships and collaboration with other operators of the same type of nuclear power plant. Forming a domestic nuclear industry in Estonia would contribute in creating the critical mass of competence and knowledge that is necessary in the long run. Creating national nuclear academic educational programmes is not foreseen to be necessary but could be an option if a domestic nuclear industry is formed in Estonia. University courses that allows for specialization within existing educational programmes such as engineering are however deemed to be necessary.

2.2. Workforce Plan

Staffing needs of the three actors will vary over the course of the nuclear power programme, both in terms of competence and number. Generally, the staffing needs are lower for the SMR-type reactors than for conventional reactors due to more standardization and services provided by the vendor. The staffing needs also depends on which technology is finally selected along with the licensing approach.

If there is a decision to build two units it will affect the staffing needed mainly for the *Owner* in phase 3 and operation phase since the operational staff will be doubled. This assumes that the staffing of the second unit is a copy of the first unit and that shared services will not be affected to a large degree. The impact on other actors is limited, but the *Regulator* is expected to have a continuous staffing need when the first unit enters operation instead of a decline that would otherwise be expected. Even if the licensing is done once for both units it's expected that there is a need for additional inspection resources since both the unit under construction and the unit in operation requires inspection activities.

The *Government Nuclear Implementation Organization* has the role of forming the Nuclear Power Programme and does only exist during the first and second phase. All competences needed must be in place early in the first phase since the main task of the of the Government actor is to set up and implement the Regulator.

The *Regulator* is formed in the beginning of phase 2, and since the regulatory framework needs to be in place for the application required resources needs to be in place at the *Regulator* or there is a risk of delay of the entire programme. The period after the application is submitted is the most resource intense for the *Regulator* and the staffing needs remains constant with a slight decrease towards the end of phase 3.

The main tasks for the staffing of the *Owner* differ between the phases. The staff needed in the first phase is limited since the activities are mostly to prepare for the national decision of starting a nuclear programme. Phase 2 includes selection of technology and preparation for an application of the selected reactor type. These and other activities in phase 2 require a larger number of staff. Phase 3 starts with signing of a contract, and a project is started which is reflected in the increasing number of staff needed. The staffing continues to increase later in phase 3 with the finalization of the reactor and the preparations for the operation phase. The staffing is again slightly increased in the operation phase when the operational staff is in place. The staffing is expected to remain higher than the final operational staffing up until and including the first outage.

References

[1] IAEA Nuclear Energy Series NG-G-3.1 (Rev. 1), Milestones in the Development of a National Infrastructure for Nuclear Power International Atomic Energy Agency

[2] Fazio, C. et al. (2016) Opportunities for building nuclear competences and their exploitation: A preliminary analysis. I Proceedings of the European Nuclear Society Conference. Berlin, Germany, May 22-26, 2016, p18-27.