Nuclear Power Plant Krško 2 Action Plan

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ABSTRACT

GEN energija d.o.o. (further referred as GEN), in the context of its business and development plan, carries out activities for the preparation on the construction of a new Nuclear Power Plant (NPP) Krško 2. Construction of new NPP is a large and extensive project which demands a lot of activities to be done in the preparatory phase of the project.

The paper will present the scope and content of NPP Krško 2 Action Plan. It outlines necessary activities to provide technically justified, efficient, transparent and responsible development of the project and it’s successful completion. Action plan provides an overview of important phases of the project and discuss short-term and mid-term activities arising therefrom. The NPP Krško 2 Action plan also provides the strategy of the project management and project implementation.

Important part of the NPP Krško 2 Action plan is project schedule with individual phases, assumptions and the most important activities. It also defines owner's responsibilities during different phases and describes comprehensive and integrated project management plan, project phases and processes. The delineation of project schedule on five different phases and descriptions of each phase were prepared as well as description of project implementation schedule assumptions, major steps of project management like strategic decision-making process and establishment of a company for construction phase. Action plan also establishes project management system with associated procedures and software support.

Key phases of action plan are planning and preparation phase, site evaluation and preparation, bidding process, construction and commissioning with preparation for operation phase.
1 INTRODUCTION

The purpose of the NPP Krško 2 Action Plan is to outline necessary activities to provide technically justified, efficient, transparent and responsible development of the Krško 2 project and its successful completion. Document provides an overview of important phases of the project, discusses short-term and mid-term activities arising therefrom and clearly suggests the strategy of project management and implementation. The document will be revised in line with project progress. Main goals during the preparation of the document were to delineate the project schedule to five different phases, to clearly define time schedule assumptions of Krško 2 project, describe most important activities of the project and owner’s responsibilities during different phases, and to prepare comprehensive integrated project management plan, project phases and processes.

2 COMPREHENSIVE OVERVIEW OF THE PROJECT

Different Krško 2 project implementation scenarios were identified in the study called Time schedule for obtaining of permits for the NPP Krško 2 (TPU)[1]. In the scope of TPU study [1], several different time schedules were prepared which differ between each other due to different assumptions such as different approaches to legislative procedures implementation, inconsistence of legislation in different legislative areas, different conceptions of meeting deadlines (legislative and actual deadlines), different conceptions of acceptable risk levels on the project and other assumptions (financial and human resource), which determine successful project implementation.

Frequent legislation changes in the Act Regarding the Siting of Spatial Arrangements of National Significance in Physical Space (ZUPUDPP)[2] and failures to comply with legislative deadlines by state authorities bring unacceptable project risks. Therefore, Action plan is based on risk related to administrative procedures mitigation and on investment decision in latest phase of the project when location will be approved as appropriate to build nuclear facility. Project is divided into following phases:

- **PHASE 1** - Preparation and strategic decision-making phase (Strategic political decision-making process about future energy development and policy in Slovenia.),
- **PHASE 2** - Selecting and confirming the location (Administrative approval procedure or siting process for the purpose of Krško 2 construction location confirmation, based on adopted regulation about National Spatial Plan (NSP) and received Environmental Consent for facility.),
- **PHASE 3** – Krško 2 Investment Decision-making (Supplier selection and searching for potential Krško 2 project investors, acquisition of Construction Permit.),
- **PHASE 4** - Construction of Krško 2,
- **PHASE 5** - Krško 2 Operation (Obtaining operating license).

3 TIME SCHEDULE AND ASSUMPTIONS

Krško 2 time schedule (Figure 1) is based on different assumptions like project time shortening, cost risks mitigation and investment decision-making in the latest stage of the project, which strongly reduces cost risks as well as increases a value of GEN’s participation in investment due to confirmed Krško 2 location for construction.
Proposed approach differs from the current practice in Slovenia, where after the investment and supplier confirmation, location finding and location confirming process for the facility follows. Such practice isn’t new and it has been implemented in many countries (e.g. USA, UK,…), therefore change of the legislation in similar manner is proposed within the Action Plan. This enables greater schedule flexibility of project implementation (taking into account current financial situation in the electricity market and identified risks). It also enables the transition to accelerated implementation of procedures within the administrative procedure (e.g. NSP, Environmental Consent, Construction Consent, obtaining Construction Permit) at any phase of the project and increases cost and time risks as well. The beginning of the administrative procedure for Krško 2 siting depends on strategic decision-making timeframe of Energy Concept for Slovenia (EKS). A new strategic document is introduced in a new Energy act (EZ-1) [3] in which priorities in the field of energy for the further 20, 40 years will be outlined. Further usage of nuclear energy has to be written in EKS document, which means the beginning of the Krško 2 project management process implementation.

![Diagram showing project phases and milestones](image)

4 **PROJECT MANAGEMENT**

The Action Plan introduces contents and processes necessary for successful completion of the project. The basic project management process (Figure 2) is through the various project phases namely project initiation, planning, implementation, monitoring and control and completion generally introduced. Each project phase has to be completed with appropriate
content and processes, therefore the Action plan will be further developed parallel to the Krško 2 quality management system.

![Diagram of project management process]

**Figure 2: Basic Project Management Process.**

### 4.1 Strategic Decision-Making

Ministry of Infrastructure and Spatial Planning (MZIP) prepared already mentioned Energy Act (EZ-1) [3] in first quarter of 2014, which regulates the energy sector and fully or partly transfers 10 directives and 5 regulations of European Commission into the Slovenian legal order. The Proposal of EZ-1[3] introduces an Energy Concept for Slovenia (EKS) in which targets of secure, sustainable and competitive energy supply over the next 20 years and a frame for next 40 years will be defined, based on international obligations, economic, environmental and social development projections of the country. Hierarchically lower document in the scope of EZ-1[3] will be the National Energy Development Plan (DREN) in which significant investments in energy infrastructure will be introduced. Within one year after adoption of EKS the proposal of DREN should be prepared and submitted by the ministry responsible for energy to the Government for adoption. As a basis for administrative (Sitting) procedures initiation Action Plan in phase 1 foresees adopted EKS showing the trend of production capacities in Slovenia and further usage of nuclear energy. The beginning of administrative authorization procedure is linked to the granted Energy Permit (ED) for the Krško 2 issued in accordance with EZ-1[3] based on the adopted energy strategy.

### 4.2 Company Establishment

Potential Krško 2 implementation company establishment [4] is suggested within the Action Plan in phase 2. The establishment of a company depends on legal-status relationship between investors in the project. Different models of legal-status forms enable different degrees of regulation of mutual relations at the basic level of the company legal act, either as a publicly limited company or a limited liability company. Within the selection of legal-status form in addition to chosen business model and legal characteristic the following elements are necessary to be taken into account: The number and determination of investors, the purpose of investor, the ratio of equity and debt financing. Three basic models are eligible for the investment implementation. The holders of the investment could be GEN itself, a new subsidiary of the GEN Group or a new company outside the GEN Group.

The establishment of new company within the GEN group funded by the other domestic and foreign investors is proposed. The holder of the Krško 2 investment is foreseen to be a newly formed limited liability company between predefined stakeholders whose interest would be the provision of permanent power and electricity produced in the Krško 2. Thus investors’ purpose won’t be the profits of newly established company but the price of electricity charged by a new legal entity. As a starting point it is necessary to assume that GEN retains the majority shareholding in such company. This implies a parent and subsidiary company relationship, thus
the relationship of business concern. The chosen form is the broadest and enables more opportunities for the establishment of special legal relationship between the investors.

4.3 Project Management System

Prior to the potential establishment of a company for the Krško 2 project implementation, the activities for the establishment, evaluation and continuous improvement of process-oriented management system defined by the IAEA GS-R3 [5] document are GEN management’s responsibility. All applicable requirements in the nuclear field in terms of quality, safety and project management established by Slovenian Nuclear Safety Administration, Western European Nuclear Regulators Association-WENRA, International Atomic Energy Agency-IAEA and requirements defined in ISO standards shall be provided.

GEN has developed quality management system for the purposes of Krško 2 project with the fundamental elements such as quality policy, quality manual, 6 system procedures and 21 processes (Figure 3), which covers the activities after the project decision is made. Therefore the process oriented approach is necessary in order to achieve effectiveness of activities control and it’s implementation.

4.4 Project Management Software Support

Project management system can only be effective through establishment of a high level of project management culture, business processes, quality, risk, knowledge, changes, etc…, which are necessary to achieve through optimal software support of the system. Action plan foresees the establishment of a mature and robust project management and planning system, business process management system and document and data management system.

4.5 Tender Documentation and Supplier Selection Process

The Action Plan also deals with preparation of tender and supplier selection process which is one of the most challenging processes. Basis of the plan and activities preparation are

Figure 3: Krško 2 identified processes.
documents IAEA NG-T-3.9 Invitation and Evaluation of Bids for Nuclear Power Plants [6], and two processes in the frame of QMS for Krško 2 project 4-2-4 NPP RfQ document preparation process and 4-2-5 Bid clarification process given in [7].

The ultimate goal of the process is to sign a contract with the most appropriate bidder which provides construction and operation in line with legislation, safety requirements and owners` expectations.

The purpose of the tender documentation is presentation of Owners` requirements (technical, quality, commercial, financial), conditions and circumstances under which supplier will be required to perform its contractual obligations, offers content and presentation of criteria for bids evaluation.

After the preparation and approval of tender documents, the legislation in the field of public procurement have to be taken into account, thus the tender documentation will be published on the public procurement portal. Due to long preparation of bids (about 10 months), potential bidders will be asked about the purpose of their preparation and submittal. In the preparation phase of tenders the process of questions and answers to the requirements of the tender documentation (4-2-5 Bid clarification process [7]) will be established. All bidders will be regularly and formally informed about the questions (requests) and answers related to bid preparation requirements. During the evaluation phase of the tender the technical, quality, economic, financial and contractual aspects will have to be taken into consideration.

4.6 Site preparation

Pre-preparatory activities of site preparation are divided into the following sets [8]:

1. preparatory works,
2. construction of additional facilities outside the Krško 2 site area,
3. construction of residential buildings for workers,
4. plateau preparation in several phases,
5. construction of temporary facilities in several phases,
6. implementation of the construction pit and construction of certain underground facilities,
7. transport routes.

A comprehensive schedule foresees a period of 3 years for the scope of work realization. The Action Plan identified and described approaches to activities of individual phases of site preparation where time savings can be achieved:

1. Preliminary site preparation works

Some of pre-preparation activities should be started before the validity of NSP, like as site pre-preparation designer selection, procurement and preparation of the Project for Acquisition of a Construction Permit (PGD), procurement and preparation of the Project for Execution Documentation (PZI). Parallel to obtaining of above mentioned project documentation and partly preparation of tender documentation of site pre-preparation, bids acquisition and bids evaluation should be carried out. Acquisition of Construction Permit should be followed by contractor selection confirmation and contract signing.
4. Plateau preparation in several phases

Plateau preparation is planned to be carried out in 2 phases but the construction of certain underground facilities should be carried out between the first and the second phase. The final plateau preparation is pointless until concrete and large-scale excavation works are not completed.

5. Construction of temporary facilities in several phases

The first phase of temporary facilities construction should take place simultaneously with the first phase of plateau preparation. The purpose of this simultaneity is a preparation of essential infrastructure including concrete production, reinforcements and formworks preparation facilities.

6. Implementation of the construction pit and construction of certain underground facilities

Works on technological facilities such as laying and fixing the main cooling pipelines or constructing of cable kinetic to the NEK switchyard which are reasonable to be implemented at this time. The construction pit implementation for reactor building should be included.

4.7 Construction of NPP Krško 2

Within the phase 4 the Action Plan foresees a completion of the following main activities for successful implementation of the project: construction of Krško 2, mechanical work, electrical work and instrumentation and control (I&C), hiring personnel for plant operation, operation and maintenance personnel training, operating and maintenance programs, procedures preparation and equipment transportation to a location.

4.8 Operation of NPP Krško 2

Within the phase 5 (operating of NPP Krško 2) Action Plan foresees completion of the following main activities for the successful completion of the project:

1. Receipt and submission of the first nuclear fuel,
2. Preparation of annexes to application for trial operation and
3. Commercial operation.

4.9 Process Management

Within the Action Plan the Process management during various project phases is also described. Summarized below are key areas of process management.

4.9.1 Project Initiation

Each project requires a project initiation process where project authorization and Project file organization strategy is defined. The Action Plan foresees an establishment of project authorization processes and process of promoting document (information) availability for purposes of enhancing productivity.

4.9.2 Planning Phase

The project planning and control process includes key elements of project management and control, supported by the following plans: Project Integration Plan and Project Strategy, Project Risk Management Plan, Project Scope Management Plan (WBS), Project Schedule...

4.9.3 Implementation Phase

In the context of project implementation key guidelines and activities for the following processes are specified within the Action Plan: Integrated Project Execution and Risk Management, Acquiring Project Teams, Performing Quality Assurance, Performing Safety Assurance and Performing Environmental Assurance.

4.9.4 Project Monitoring and Control

Also key guidelines and activities for the following processes in the context of Project monitoring and Control are specified within the Action Plan: Project Management Effectiveness Evaluation Process, Monitor and Control the Integrated Project Including Risks, Integrated Change Control, Scope verification and Scope Change Control, Schedule Control and Progress Monitoring, Cost Monitoring and Financial Control, Contract Administration and Claim Prevention, Safety Control, Environmental Compliance.

4.9.5 Project Closure

In the context of Project Closure Action Plan specifies key guidelines and activities for the following processes: Closing Process, Functional Testing, Scope Verification and Acceptance, Start-up and Integration, Development of Lessons Learned, Development of Next Phase Initiation Basis and Paperwork, Completion of Accounting Processes Paperwork, Archiving Project Information for Historical Reference, Demobilization and Claim Resolution and Contract Closure.

5 CONCLUSIONS

The Action Plan is a document which clearly indicates the strategy for Krško 2 project implementation at different stages and areas of the project. It describes the current status of the project, i.e. activities on the project which has already been done, and identifies future necessary activities for successful project implementation as well. All key intermediate objectives which shall be met for successful project implementation such as the proposal of new regulatory concept, reduction of the project risks, placement of nuclear energy as an option in the EKS, the establishment of project management process through all project phases, the establishment of new company for the purpose of project implementation, development of management system, etc… are indicated as well as project management guidance through all project phases.

Current status of the project is the stage of performing technical, siting, construction optimization and project preparation analyses. The next stage is political decision to implement the project and to achieve the social acceptability of the project which pose a triggers for project initiation.

The Action Plan represents a set of contents and scopes which will have to be discussed in details before or during the different project phases after the project initiation. The first revision of the document revealed a rough picture of the current project status and indicated
some risks and opportunities expected in the future as well. Future revisions of Action Plan are expected to be more detailed in line with the future Krško 2 project development.

REFERENCES

[1] Savaprojekt d.d., Time schedule for obtaining of permits for the NPP Krško 2 (Terminski plan umesčanja JEK2 v prostor), Krško, October 2012


[4] Institute for Comparative Law at the Faculty of Law in Ljubljana (IPP-PF), The Legal Framework for the Construction and Operation of JEK 2 (Pravni okvir gradnje in obratovanja JEK 2), Ljubljana, November, 2010


[7] QualiFinn Engineering Oy, Quality management system for JEK 2 Project, 2011


