ACTION PLAN WITH TIME SCHEDULE OF JEK2 CONSTRUCTION SITE ARRANGEMENT

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ABSTRACT

Construction of a nuclear power plant in Slovenia is a unique project which requires effective, efficient and transparent process of preparation and construction of the site. After 30 years of successful operation of the first nuclear power plant (NEK), company GEN energija began the process of planning and preparatory work for construction of the second nuclear power plant (JEK2) in Slovenia. GEN energija combines with other portfolio goals also maintenance and expansion of nuclear capability as the pillar of sustainable development in Slovenia.

An Action plan with a Time schedule will be presented, which includes all activities required for obtaining a final and binding Construction Permit for pre-construction site preparation and all relevant activities providing due start of technological facilities construction.

Presented Action Plan has been developed for the western (upstream location/site regarding existing NPP) alternative. The eastern (downstream) alternative was assessed similarly, since only a minor part of certain activities are excluded due to differences between locations. At the upstream site certain infrastructural re-arrangements are required which are not relevant at the downstream site; however, the downstream site is more demanding in context of excavations and relocation of excess dredging material.

Activities relating to the pre-construction site preparation are divided into the following sets: Preliminary works, Construction of auxiliary buildings outside the JEK2 construction site area, Construction of residential units for workers accommodation, Phase arrangement of the platform, Phase construction of temporary structures, Performance of construction pit and construction of certain underground facilities.

In the Time Schedule, performance of pre-construction site preparation activities for the western location will be shown. According to the overall JEK2 Time Schedule, a period of 3 years is foreseen for the listed scope of activities and it can be further optimized.
1 ACTION PLAN OF JEK2 CONSTRUCTION SITE ARRANGEMENT

1.1 Introduction

Action Plan with Time Schedule includes all activities required for obtaining a final and binding Construction Permit for pre-construction site preparation and all relevant activities providing due start of technological facilities construction.

The Action Plan has been developed for the western (upstream) alternative; we estimate the eastern (downstream) alternative similarly demanding since only a minor part of certain activities does not appear. At the upstream site certain infrastructural re-arrangements are required which are not relevant at the downstream site; however, the downstream site is more demanding in context of excavations and relocation of excess dredging material. The eastern and western locations of JEK2 are in immediate vicinity of the existing NPP as shown in Figure 1 and Figure 2.

Figure 1: Layout of eastern location of JEK2
1.2 Starting points

Up to the adoption of the Decree on the National Spatial Plan (DPN) relating to JEK2 the activities of pre-construction site preparation shall be carried out together with the activities relating to construction of JEK2. This set of activities includes:

- Preliminary activities:
  - Development of expert bases,
  - Classification of JEK2 into National Energy Program,
  - Classification of JEK2 into Spatial Development Strategy of the Republic of Slovenia (RS),
  - Acquisition of Energy Consent,
  - Project promotion, communication with public (public relations),
  - Adoption of a special Law on JEK2,
  - Acquisition of necessary consents of the Slovenian Nuclear Safety Administration (URSJV),

- Preparation of an initiative including bases,
- National Spatial Plan procedure,
- Adoption of the Decree on the National Spatial Plan,
- Development of JEK2 Feasibility Study,
- Land acquisition.
After the Decree is adopted, the Project will be divided into several Sub-projects; one of them is pre-construction site preparation.

1.3 **Action Plan and Time Schedule of pre-construction site preparation**

Activities relating to the pre-construction site preparation are divided into the following sets:

- Preliminary works,
- Construction of auxiliary buildings outside the JEK2 construction site area,
- Construction of residential units for workers’ accommodation,
- Phase arrangement of the platform,
- Phase construction of temporary structures,
- Performance of construction pit and construction of certain underground facilities.

According to the overall JEK2 Time Schedule a period of 3 years is foreseen for the stated scope of activities and it can be further optimized.

1.4 **Preliminary works of pre-construction site preparation**

The set of activities named "preliminary works" includes the activities relating to:

- Development of design documentation and selection of Contractors for pre-construction site preparation,
- Re-location of the existing infrastructure,
- Preparation of the platform,
- Provision of temporary and permanent infrastructure connections for JEK2.

1.4.1 **Development of design documentation and selection of Contractors for pre-construction site preparation**

The sub-set includes:

- Selection of a Design Engineer for pre-construction site preparation,
- Elaboration of the Design for obtaining Construction Permit (PGD) covering pre-construction site preparation,
- Acquisition of the Construction Permit for pre-construction site preparation,
- Elaboration of Detailed Design (PZI) for pre-construction site preparation,
- Development of Tender Documents for pre-construction site preparation,
- Calls for Tenders for pre-construction site preparation,
- Tenders evaluation,
- Selection of Contractor for pre-construction site preparation,
- Contract award.
If we want to save time and complete all activities relating to the pre-construction site preparation on schedule, some of the activities like:

- selection of a Design Engineer for pre-construction site preparation,
- order and elaboration of Design for obtaining Construction Permit for pre-construction site preparation,
- order and start of works on the elaboration of Detailed Design documents (PZI) covering the pre-construction site preparation

should be started in advance, this is before the Decree on the National Spatial Plan comes into force and effect. The procedure relating to acquisition of the Construction Permit for the pre-construction site preparation shall be started after the Decree has come into force and effect. During the Construction Permit acquisition period, design engineering of the PZI phase and partly also:

- development of Tender Documents for pre-construction site preparation,
- call for Tenders for pre-construction site preparation,
- tenders evaluation

shall be carried out.

After the Construction Permit has been obtained, the Contractor selection shall be confirmed and the Contract awarded. In this way all the required activities are carried out in the shortest time possible and the Contractor (contractors) of civil construction works is selected.

1.4.2 Re-location of existing infrastructure

Prior to the platform arrangement and structures construction activities start, the infrastructure existing for the future JEK2 area shall be re-located. At the upstream site, the following structures shall be re-located:

- $110$ kV Krško-Hudo OH transmission line,
- Main gas supply pipeline,
- Water supply line,
- Sewage system.

At the downstream site, only the water supply line shall be re-located.

1.4.3 Preparation of the platform

Works on the platform include three sets of activities: platform preparation, platform arrangement 1st stage and platform arrangement 2nd stage. In the first set of activities, the platform part for erection of offices, dining rooms and toilets for workers engaged in the pre-construction site preparation (1st stage) shall be arranged, the platform shall be protected against floods and the access roads and platforms for disposal and machinery shall be constructed.

More in detail, the first set of activities relating to the platform arrangement includes as follows:
• Construction of flood embankments for the construction site protection against flood waters,
• Construction of access roads and parking areas,
• Arrangement of a part of platform for toilets, cloak rooms and office complex construction,
• Arrangement of entrance to the construction site,
• Solidification of the most important access roads and rideable surfaces,
• Arrangement of a platform for construction (and installation) machinery,
• Arrangement of the office, dining and toilet complex on the construction site – 1st stage,
• Arrangement of surfaces for temporary and permanent disposal of dredged material.

The scope of stages 1 and 2 is given more in detail in Chapter 1.7.

1.4.4 Provision of temporary and permanent infrastructure connections for JEK2

The last set of activities referring to the pre-construction site preparation works includes:
• Electric power supply of the construction site (10/0.4 substation, branch lines, lighting),
• Water supply of the construction site (potable and process water),
• Faecal sewage system arrangement,
• Biological water treatment plant construction.

This will provide for the construction site to start with extensive civil construction works.

1.5 Construction of auxiliary structures outside the JEK2 construction site area

Due to a lack of space on the immediate location of the new JEK2 and certain limitations as regards staying overnight in the area of 1500 m from NEK, certain facilities will have to be constructed outside the JEK2 construction site area:
• Construction of a campus and social welfare infrastructure – 1st stage,
• Arrangement of areas for temporary and permanent disposal of dredged material on dislocated sites,
• Construction of storage facilities for equipment and arrangement of a customs warehouse area.

With due arrangement of the auxiliary structures outside the JEK2 construction site area the wider construction area will be prepared for extensive civil construction works as well.

1.6 Construction of residential units for workers’ accommodation

On the basis of the new JEK2 construction concept and the size of the facility it will become possible to define more in detail due requirements for accommodation of workers participating in the construction as well as of those employed later in the new facility. Here
we would like to present in particular when the activities will have to start and how they should be managed within the defined Time Schedule in order to provide due availability of the required accommodation at a right time. Construction of residential units for accommodation of workers includes:

- Elaboration of spatial documentation,
- Elaboration of design documentation,
- Selection of a Contractor,
- Construction of apartments and houses.

1.7 Platform arrangement in two stages

The platform arrangement will be carried out in two stages since in-between the two stages, construction of certain underground technological structures of the new JEK2 will be performed. This includes also concrete works with extensive excavations. A final platform arrangement would be unreasonable as long as these works are not accomplished.

1st stage:

- Earth works for the platform arrangement,
- Solidification of other access roads and rideable surfaces in the construction site area,
- Partial arrangement of the platform by backfilling of quality material,
- Hydrant grid construction (1st stage),
- Installation of a safety fence around the construction site,
- Arrangement of shafts (collecting trays), drains and retaining basins.

Between stages 1 and 2 of the platform arrangement the construction pit excavation works as well as construction of certain underground technological structures (cooling pipings, cable ducts) shall start.

2nd stage:

- Final platform arrangement with backfilling and compaction of quality material,
- Construction of foundations for erection of a heavy lift crane (HLC),
- Construction of a platform for construction cranes.

With accomplishment of the 2nd stage the platform of the new JEK2 will be prepared for construction of the second part of temporary structures which will be used during construction of JEK2.

1.8 Phase construction of temporary facilities

The first stage of temporary facilities construction shall be performed simultaneously with the first stage of the platform arrangement. The purpose of this simultaneity is to prepare the mandatory infrastructure including structures for concrete, reinforcement, formworks and similar preparation prior to the start of certain underground JEK2 technological facilities construction (Figure 3). The first stage includes:

- Construction of a concrete mixing plant,
- Erection of a workshop for preparation and disposal of shutters,
• Erection of workshops and storage facilities (1st stage),
• Construction of a steel bending plant and erection of a tower crane.

The second stage shall be performed after the final platform arrangement is completed, and shall include:
• Erection of workshops and storage facilities (2nd stage),
• Preparation of a platform for reinforcement and formworks elements,
• Arrangement of an area for construction of a steel Containment Vessel shell,
• Arrangement of the Module Erection Platform,
• Construction of a Module Assembly Building,
• Erection of a Heavy Lift Crane (HLC),
• Erection of tower cranes.

Figure 3: Construction site arrangement

1.9 Performance of construction pit and construction of certain underground facilities

Certain works on technological structures which are reasonable to be performed within this time, such as:
• Excavation and arrangement of construction pit,
• Laying and fixing of main cooling pipelines,
• Construction of a cable duct up to the NEK switchyard
were included into the pre-construction site preparation works as well.

This set of activities consists of performance and arrangement of the Reactor Building construction pit. These include extensive civil construction works for which it would be reasonable to accomplish them prior to the final platform arrangement as well (2nd stage). However, depth and size of such construction pit largely depend on the selected reactor technology. This is why we leave the analysis of performance of such underground facility to the analysis of construction of the JEK2 Technological Building (Reactor and Turbine Building). The required time given in the Time Schedule serves just for orientation.

2 TIME SCHEDULE

After termination of the activities given under Chapter 1, the plateau is prepared for construction of permanent facilities of the new JEK2 plant.

In the Time Schedule (Figure 4 and Figure 5), performance of pre-construction site preparation activities for the upstream (western) location is given. At the beginning it has already been mentioned that the Time Schedule referring to the downstream site is slightly different.

We can assume that these activities are time-compensating and that on the level of the Study, it is reasonable to cover the scope of all scheduling alternatives with a single schedule. Some items are different in their quantities; some of them are performed at an earlier stage. At the downstream site, the following items do not need to be performed:

- Re-location of the 2 × 110 kV Krško-Hudo OH transmission line,
- Re-location of the main gas pipeline and sewage system (only the water supply line can stay intact).

For this phase of documentation, the pre-construction site preparation is given with a single Time Schedule [1].
Figure 4: Time Schedule of the JEK2 pre-construction site preparation
Figure 5: Time Schedule of the JEK2 pre-construction site preparation
REFERENCES
