

KRŠKO NUCLEAR POWER PLANT
ENGINEERING SERVICES SPECIFICATION

TECHNICAL SPECIFICATION

Evaluation of impact of JEK2 on NEK



Non-Nuclear Safety Related

Specification Number
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KRŠKO NUCLEAR POWER PLANT

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TABLE OF CONTENTS

1	BACKGROUND	3
2	SCOPE OF WORK.....	3
3	SAFETY CLASSIFICATION OF SERVICES	5
4	DESIGN INPUTS.....	5
5	APPLICABLE WORK CONTROL PROGRAM.....	7
6	APPLICABLE CODES, STANDARDS, AND DESIGN CRITERIA.....	7
7	AFFECTED SYSTEMS	8
8	IDENTIFICATION OF AFFECTED EQUIPMENT	8
9	REVIEW AND/OR VERIFICATION OF SERVICES.....	8
10	SCHEDULE	8
11	STATUS REPORTING REQUIREMENTS.....	8
12	NEK RESPONSIBILITIES	8
13	WORK SCOPE CHANGES.....	9
14	DELIVERABLES.....	9
15	RECORDS.....	9
16	NEK CONTACTS	9
17	CONTRACTOR TECHNICAL APPROACH	10
18	ACCESS TO CONTRACTOR FACILITY AND DOCUMENTS	10
19	SUBCONTRACTED WORK.....	10
20	QUALITY ASSURANCE REQUIREMENTS	10
21	NEK PROPRIETARY DATA.....	10

1 BACKGROUND

At the end of 2024, GEN energija d.o.o. submitted an initiative to the Ministry of Environment, Climate and Energy for the National Spatial Plan (NSP) for the placement of the Nuclear Power Plant Krško 2 (NSP JEK2). The initiative for NSP JEK2 refers to the construction of a new nuclear facility, functionally and organizationally completely separated from NEK, along with accompanying and functionally related spatial arrangements necessary for the construction and operation of the new nuclear power plant.

NEK prepared a Risk Assessment to evaluate the potential impacts on safety and operation of NEK during the construction and operation of JEK2 (ref. 15). Risk Category 1 (higher risk) has been identified. A working group for NEK has been established, whose task is to monitor and analyze the progress of the JEK2 project and identify any potential impacts on NEK. Preparation of this study is also one of the activities planned as a result of the Risk Assessment.

Due to the anticipated possibility of JEK2 construction, it is necessary to assess the potential impacts of JEK2 on the existing Krško NPP (NEK). It must be ensured that the spatial placement and design of JEK2 will not adversely affect NEK and that NEK will not suffer operational limitations or other consequences arising from potential changes of legal or regulatory framework and additional restrictions on land use in accordance with valid NEK rights and positive regulations.

2 SCOPE OF WORK

The Contractor shall perform a comprehensive study to evaluate potential impacts of the planned new nuclear power plant (JEK2) on the existing Krško Nuclear Power Plant (NEK). The objective is to identify, assess, and propose measures to prevent, limit or mitigate any direct or indirect effects of JEK2 on the safe and reliable operation of NEK.

The scope of services includes, (but is not limited to), the following:

2.1 Review of Project Documentation

- Submitted initiative for the National Spatial Plan (NSP) for JEK2,
- Review of available technical, environmental, and legal documentation related to NEK (see Chapter 4).

2.2 Impact Assessment – Evaluation (Analyses)

The Contractor shall examine the potential impact of JEK2 on NEK during both construction and operational phases. Contractor shall perform identification of critical infrastructure, systems and processes at NEK potentially affected by JEK2, as well as impact on NEK's licensing basis.

2.2.1 Evaluation of potential impacts during the **construction** phase of JEK2, including, but not limited to, the following:

- Flood protection and water management,

- Possible cooling water supply disruption, including, but not limited to, the following:
 - Examine the impact of inlet water temperature on NEK ESW system (UHS parameters),
 - Examine potential additional clogging of river water cleaning systems (ESW & FP, CW), potential foam formation due to JEK2 construction,
 - Examine impact on NSR systems (CW, CT, RD) and consequently potential effects on NEK production capability,
 - Examine the potential limitations of NEK River Dam operation due to JEK2, lowering Sava river level during NEK outages, etc.
- Ground stability and seismic risks,
- Fire safety and emergency preparedness and response,
- Physical protection and security,
- Impact on preservation of evacuation routes and safety zones,
- Human resources availability and workforce migration,
- Potential impact of projectiles from JEK2 on NEK,
- Potential impact on NEK's external power supply,
- Construction site logistics and accident risk,
- Postulated human-induced external events associated with construction,
- Vibration, noise, and dust emissions,
- Potential impact on switchyard,

2.2.2 Evaluation of potential impacts during the **operational phase of JEK2, including, but not limited to, the following:**

- Flood protection and water management,
- Ground stability and seismic risks,
- Thermal and hydrological impacts on the Sava river,
- Air and water emissions,
- Radiological impact (radiation dose implications for NEK perimeter, cumulative dose impact - normal operation and accidents),
- Potential regulatory changes affecting NEK permits and operations,
- Microclimatic changes and cooling tower performance,
- Coordination of outages and shared external infrastructure,
- Fire safety and emergency preparedness and response,
- Potential impact of projectiles from JEK2 on NEK and other external hazards,
- Potential impact on NEK's external power supply,
- Impact on NEK's licensing basis (USAR, DBAs, DEC, PSA, etc.),
- Physical protection and security,
- Human resources availability and workforce migration,
- Potential impact on switchyard,
- Emergency Preparedness (evacuation routes, safety zones, etc.).

The task of the contractor in accordance with this specification is to determine the potential impact of the JEK 2 on NEK.

2.3 Documentation of the Work

The contractor shall propose solutions to eliminate or mitigate the identified impacts. The solutions should be considered as:

- input data for the planning and design of JEK 2 (as an input to design inputs requirements),
- legal basis and administrative limitations for preventing impact on NEK.

Documentation must be handed over to the customer in accordance with Chapter 14.

3 SAFETY CLASSIFICATION OF SERVICES

This order is classified as non-nuclear safety related (NNSR).

4 DESIGN INPUTS

Available input documents:

- [1] Initiative to the Ministry of Environment, Climate and Energy for the National Spatial Plan (NSP) for the placement of the Nuclear Power Plant Krško 2 (NSP JEK2).
- [2] Updated Safety Analysis Report (USAR), latest revision
- [3] Technical Specifications (TS), latest revision, Design Extension Conditions Technical Specifications (DECTS), latest revision, Radiological Effluent Technical Specifications (RETS), latest revision, Nek Spent Fuel Dry Storage Technical Specifications And Design Extended Conditions Technical Specifications (SFDS TS & DECTS), latest revision.
- [4] Environmental permit for emissions into water (Environmental Agency of the Republic of Slovenia, No. 35441-103/2006-24 of 30. 6. 2010, which was amended (amended points 1.1, 1.4 and 1.8) and re-decided by decision No. 35441 103/2006-33 of 4. 6. 2012 and amended (amended point 1.5, Table 3) by decision No. 35444-11/2013-3 of 10. 10. 2013 (Okoljevarstveno dovoljenje glede emisij v vode (Agencija RS za okolje, št. 35441-103/2006-24 z dne 30. 6. 2010, ki je bilo spremenjeno in v treh točkah izreka (spremenjene točke 1.1, 1.4 in 1.8 OVD) in ponovno odloženo z odločbo št. 35441-103/2006 -33 z dne 4. 6. 2012 ter spremenjeno (spremenjena točka 1.5, Tabela 3) z odločbo št. 35444-11/2013-3 z dne 10. 10.2013).
- [5] Environmental consent for the lifetime extension of NEK from 40 to 60 years, No. 35428-4/2021-2550-96, dated 13 January 2023, final on 21 February 2023 (Okoljevarstveno soglasje za poseg: podaljšanje obratovalne dobe NEK s 40 na 60 let, št. 35428-4/2021-2550-96, z dne 13. 1. 2023, pravnomočno dne 21. 2. 2023).
- [6] Environmental Agency of the Republic of Slovenia water permit: partial water permit No. 35536-31/2006-16 of 15. 10. 2009 and decision on amendment of water permit No. 35536-54/2011-4 of 8. 11. 2011, decision No. 35536-26/2011-9 of 23. 5. 2013, decision No. 35530-7/2018-2 of 22. 6. 2018 (Vodno dovoljenje ARSO: delno vodno dovoljenje št. 35536-31/2006-16 z dne 15. 10. 2009 in odločba o spremembi vodnega dovoljenja št 35536-54/2011-4 z dne 8. 11. 2011, odločba št. 35536-26/2011-9 z dne 23. 5. 2013, odločba št. 35530-7/2018-2 z dne 22. 6. 2018).
- [7] Location Permit: Decision by the National Secretariat for Urban Planning, No. 350/F-15/69, dated 8 August 1974, and the Decree on the NEK Development Plan UN 55/87; Official Gazette of SRS, No. 48/87; the Decree on the Modifications and Amendments of the Decree on the NEK Development Plan; Official Gazette of SRS No. 59/97, and the Decree on the Modifications and Amendments of the Decree on the NEK Development Plan; Official Gazette of SRS, No. 21/20 (Lokacijsko dovoljenje: Odločba republiškega sekretariata za urbanizem št. 350/F-15/69 z dne 8. 8. 1974 in Odlok o ureditvenem načrtu Nuklearne elektrarne Krško UN 55/87; Uradni list SRS

- št. 48/87; Odlok o spremembah in dopolnitvah odloka o ureditvenem načrtu NE Krško; Uradni list SRS št. 59/97 ter Odlok o spremembah in dopolnitvah Odloka o ureditvenem načrtu Nuklearne elektrarne Krško, Uradni list RS, št. 21/20).
- [8] Operating Licence: Decision – Approval to Commence NEK Operation; Decision by the National Energy Inspectorate, No. 31-04/83-5, dated 6 February 1984, and the URSJV Decision, No. 3570-8/2012/5, Amendment to the Operating Licence for NEK, dated 22 April 2013 (Obratovalno dovoljenje: Odločba – Soglasje za začetek obratovanja NEK; Odločba Republiškega energetskega inšpektorata št. 31-04/83-5 z dne 6. 2. 1984, Odločba URSJV št. 39000-5/2006/17, Sprememba dovoljenja za obratovanje, z dne 13. 10. 2006 ter odločba URSJV št. 3570-8/2012/5, Sprememba dovoljenja za obratovanje NEK, z dne 22. 4. 2013).
- [9] Agreement on measures and obligations to ensure the unaltered, safe, and uninterrupted operation of NEK during the operation of the Lower Sava Hydro Power Plant, with additional content for the implementation of monitoring in the Sava River by HESS and NEK, dated 14. August 2018 (Sporazum o ukrepih in obveznostih za zagotovitev nespremenjenega, varnega in nemotenega obratovanja NEK pri obratovanju HE na Spodnji Savi z dodatnimi vsebinami izvajanja monitoringa v reki Savi me HESS in NEK z dne 14. 8. 2018 (skrajšano Sporazum HESS - NEK)).
- [10] Agreement on the transfer of ownership of parts of the electricity transmission network and the regulation of mutual relations of February 13, 2007, Agreement on the technical aspects of investments in the modernization of the 400 kV switchyard NEK and RTP 400/110 kV Krško of February 13, 2007, Appendix to the Agreement on the technical aspects of investments in the modernization of the 400 kV switchyard NEK and RTP 400/110 kV Krško of October 27, 2009, Appendix 2 to the Agreement on the technical aspects of investments in the modernization of the 400 kV switchyard NEK and RTP 400/110 kV Krško of August 23, 2017, Appendix 3 to the Agreement on the technical aspects of investments in the modernization of the 400 kV switchyard NEK and RTP 400/110 kV Krško of February 7, 2019, and Appendix 4 to the Agreement on the technical aspects of investments in the modernization of the 400 kV switchyard NEK and RTP 400/110 kV Krško of August 10, 2020. (Sporazum o prenosu lastništva delov prenosnega omrežja električne energije in ureditev medsebojnih razmerij z dne 13. 2. 2007, Sporazum o tehničnih vidikih vlaganj v posodobitev 400 kV stikališča NEK in RTP 400/110 kV Krško z dne 13. 2. 2007, Aneks k sporazumu o tehničnih vidikih vlaganj v posodobitev 400 kV stikališča NEK in RTP 400/110 kV Krško z dne 27. 10. 2009, Aneks 2 k sporazumu o tehničnih vidikih vlaganj v posodobitev 400 kV stikališča NEK in RTP 400/110 kV Krško z dne 23. 8. 2017, Aneks 3 k sporazumu o tehničnih vidikih vlaganj v posodobitev 400 kV stikališča NEK in RTP 400/110 kV Krško z dne 7. 2. 2019 ter Aneks 4 k sporazumu o tehničnih vidikih vlaganj v posodobitev 400 kV stikališča NEK in RTP 400/110 kV Krško z dne 10. 8. 2020 (skrajšano Sporazum ELES - NEK)).
- [11] Act on the Ratification of the Treaty between the Government of the Republic of Slovenia and the Government of the Republic of Croatia on the Regulation of Status and Other Legal Relations regarding Investments, Exploitation and Decommissioning of NEK, and the Joint Declaration upon the Signing of the Treaty between the Government of the Republic of Slovenia and the Government of the Republic of Croatia on the Regulation of Status and Other Legal Relations regarding Investments,

Exploitation and Decommissioning of NEK (BHRNEK), Official Gazette of the Republic of Slovenia – International Treaties, No. 23/03 (Zakon o ratifikaciji Pogodbe med Vlado Republike Slovenije in Vlado Republike Hrvaške o ureditvi statusnih in drugih pravnih razmerij, povezanih z vlaganjem v Nuklearno elektrarno Krško, njenim izkoriščanjem in razgradnjo in Skupne izjave ob podpisu Pogodbe med Vlado Republike Slovenije in Vlado Republike Hrvaške o ureditvi statusnih in drugih pravnih razmerij, povezanih z vlaganjem v Nuklearno elektrarno Krško, njenim izkoriščanjem in razgradnjo (BHRNEK), Uradni list RS – Mednarodne pogodbe, št. 23/03 (skrajšano Meddržavna pogodba)).

- [12] MOP (Ministry of the Environment and Spatial Planning), DRSV (2020): Water Permit issued to Nuklearna elektrarna Krško d.o.o., No. 35530-100/2020-4 of 14 November 2020, Ljubljana (Vodno dovoljenje za vodnjake: Dovoljenje ARSO, Direkcije Republike Slovenije za vode številka 35530-100/2020-4 z dne 14. 11. 2020).
- [13] MOP, DRSV (2021): NEK Water Permit, No. 35530-48/2020-3, 9 September 2021, Ljubljana (Vodno dovoljenje za vodnjak: Dovoljenje ARSO, Direkcije Republike Slovenije za vode številka 35530-48/2020-3 z dne 9. 9. 2021).
- [14] Radiological Emergency Response Plan in NEK (RERP), Rev. 42 (Načrt zaščite in reševanja ob izrednem dogodku (NZIR NEK), rev. 42).
- [15] Risk Assessment – Potential impacts on the safety and operation of NEK during the construction and operation of JEK2, RA-24-05, Rev. 0.

5 APPLICABLE WORK CONTROL PROGRAM

All services shall be provided according to Chapter 6 and applicable Contractor's quality assurance program. If Contractor does not have such work control program, the NEK the NEK related procedures shall be applied.

6 APPLICABLE CODES, STANDARDS, AND DESIGN CRITERIA

Evaluation of Impact of New NPP on Existing NPP will depend on national regulations, IAEA guidance, international best practices, and project-specific requirements. The following documents shall be taken into account:

- 6.1 IAEA SSR-1 – Site Evaluation for Nuclear Installations.
- 6.2 IAEA SSG-38 - Construction for Nuclear Installations.
- 6.3 IAEA SSG-79 – Hazards Associated with Human Induced External Events in Site Evaluation for Nuclear Installations.
- 6.4 IAEA SSR-2/1 (Rev. 1) – Safety of Nuclear Power Plants: Design.
- 6.5 IAEA SSR-2/2 (Rev. 1) – Safety of Nuclear Power Plants: Commissioning and Operation.
- 6.6 IAEA GSR Part 4 (Rev. 1) – Safety Assessment for Facilities and Activities.
- 6.7 IAEA SSG-64 – Protection Against Internal Hazards in the Design of Nuclear Power Plants
- 6.8 IAEA SSG-77 - Protection Against Internal and External Hazards in the Operation of Nuclear Power Plants
- 6.9 IAEA GSR Part 7 – Preparedness and Response for a Nuclear or Radiological Emergency
- 6.10 IAEA EPR-NPP- Classification, Assessment and Prognosis During Nuclear Power Plant Emergencies 2024
- 6.11 IAEA INSAG-10 – Defence in Depth in Nuclear Safety.

- 6.12 EPRI Multi-unit risk assessment
- 6.13 U.S. NRC 10 CFR Part 50 & Part 100

Other as applicable as per Contractor findings.

7 AFFECTED SYSTEMS

Not applicable.

8 IDENTIFICATION OF AFFECTED EQUIPMENT

Not applicable.

9 REVIEW AND/OR VERIFICATION OF SERVICES

The Contractor is required to conduct an independent review of the work performed within their organization, in accordance with their own Quality Assurance Program.

10 SCHEDULE

Requirement	Schedule
Preliminary Study as required by Chapter 2	T0 + 8 months
NEK review/comments	T0 + 9 months
Final Study as required by Chapter 2	T0 + 10 months

T0 - date of contract signature by both parties

All of above deliverables shall be completed and submitted to NEK for review. NEK will formally respond with comments and/or acceptance to each study within one month.

11 STATUS REPORTING REQUIREMENTS

Regular communication will be used during the project. The communication channels are going to be defined on the kick-off meeting. Formal status reports are not required.

12 NEK RESPONSIBILITIES

NEK will provide documents according to Section 4 of this technical specification.

NEK will supply the Contractor with the inputs that the Contractor will require for the Scope of Work. Note that some of the documents may only be available at the NEK site due to proprietary requirements.

NEK will assist the Contractor with technical experts where support or clarification of open technical issues is required.

NEK will perform review of the Study (preliminary and final).

13 WORK SCOPE CHANGES

The Contractor shall identify any scope changes that could cause an impact the Contractor's cost or schedule of the project by the issuance of a Contractor Change of Work Scope Request. The Contractor shall not proceed with a change in the scope of the Work until written approval has been authorized by NEK. It is the Contractor's obligation to notify the NEK Responsible Person in writing of the noted scope change and it is the responsibility of the NEK Responsible Commercial Person to attempt to respond within 15 working days of the acceptability of the Contractors scope change request. Unauthorized Work will not be reimbursed by NEK.

14 DELIVERABLES

The Contractor shall prepare and hand over the following deliverables:

Deliverable Item:	Number of Copies
Preliminary Study with all attachments	1 (Adobe pdf)
Final Study with all attachments	1 (hard copy) 1 (MS Word .docx) 1 (Adobe Acrobat .pdf)

All deliverables must be reviewed and approved by NEK. NEK will formally review and provide comments on any deliverables within one month. The Contractor shall address all open items based on NEK's comments. The Contractor shall provide the Deliverables timely with the Schedule Requirements (see Section 10). All documentation shall be written in English. Electronic versions shall be provided in MS Word (.docx) format, as well as searchable Adobe Acrobat (.pdf) format.

15 RECORDS

Not applicable.

16 NEK CONTACTS

Contractor shall co-ordinate all technical and scheduling matters with the assigned NEK project manager and responsible engineer.

NEK project manager:

Aleksandra Antolovič
Phone: ++ 386 7 4802 524
E-mail: aleksandra.antolovic@nek.si

NEK responsible engineers:

Blaž Likovič
Phone: ++ 386 7 4802 646
E-mail: blaz.likovic@nek.si

Mitja Kožar
Phone: ++ 386 7 4802 025

E-mail: mitja.kozar@nek.si

17 CONTRACTOR TECHNICAL APPROACH

The bid shall contain the Contractor's interpretation of the scope of work. The bid shall also contain references to similar work performed by the Contractor.

18 ACCESS TO CONTRACTOR FACILITY AND DOCUMENTS

Not Applicable.

19 SUBCONTRACTED WORK

The Contractor shall not subcontract any portion of the required services without the written approval of the NEK. Subcontractors will be required to be technically qualified to satisfy all NEK criteria.

20 QUALITY ASSURANCE REQUIREMENTS

The work shall be performed in accordance with Contractor's QA Program, which complies with ISO 9001 or a comparable standard, and requirements of NEK QS 610, Rev.2, Generic Quality Assurance Program Requirements.

If the Contractor's QA Program Manual has not been previously accepted by NEK, it shall be submitted to NEK as part of Proposal.

21 NEK PROPRIETARY DATA

NEK has a proprietary interest in all drawings, design, specifications, documents, information and know-how that may be furnished pursuant contract execution. Also, NEK has a proprietary interest in any know-how, improvement, discovery, and invention which may be made, developed, or conceived in the performance of work hereunder or which may arise or result therefrom (hereinafter collectively referred to as the "Information"). All such information shall be considered proprietary to NEK.

The right to use any such Information shall be limited to the Contractor for internal use only and shall be entirely tied to the performance of the Contract.

All such Information is subject to the confidentiality provision.