ENERGIJA

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Technical and Investment sector

Project Activity:

PA06-003 – Geotechnical, Geological and Seismological (GG&S) Evaluations for the New Nuclear Power Plant at the Krško Site (NPP Krško II)

TEHNICAL REPORT

Designation TP-012, Revision 1

Comments on GG&S "Paleoseismological trenches on the Libna Hill" Report

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SUMMARY

Through Phase I of the project Geotechnical, Geological, and Seismological (GG&S) Evaluations for the New Nuclear Power Plant at the Krško Site (NPP Krško II), a series of investigations were performed for site evaluation. The paleoseismological survey on the Libna hill is a contractual task controlled by the Addendum 1 to the main contact between GEN energija and the Consortium (BRGM, GeoZS, IRSN, ZAG).

We received the GG&S "Paleoseismological trenches on the Libna Hill" preliminary report with Appendices 1-8 by email. GEN energija has performed an internal review on the "Paleoseismological trenches on the Libna Hill" report and provided comments in this document.

The report is extensive, however some issues are still not closed: the length of Libna fault and the age of Globoko formation. There are no requests to include conclusions about NEK in the report.

It should be stated that report becomes effective after provision and comments are given by GEN Energija and external reviewer. Comments shall be addressed, evaluated and resoluted by the Consortium before Final Report is submitted.

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1 INTRODUCTION

Through Phase I of the project Geotechnical, Geological, and Seismological (GG&S) Evaluations for the New Nuclear Power Plant at the Krško Site (NPP Krško II), a series of investigations were performed for site evaluation. The paleoseismological survey on the Libna hill is a contractual task controlled by the Addendum 1 to the main contact between GEN energija and the Consortium (BRGM, GeoZS, IRSN, ZAG).
On September 29th 2011 we received the GG&S "Paleoseismological trenches on the Libna Hill" preliminary report with Appendices 1-8 by email. GEN energija has performed an internal review on the "Paleoseismological trenches on the Libna Hill" report and provided comments in Chapter 2 and Chapter 3 of this document.

Comments in Chapter 2 were presented in the Meeting in Orléans (13.-14.12.2011). Please provide answers and explanations based on our comments in Chapter 2. Comments shall be addressed, evaluated and resoluted by the Consortium before Final Report is submitted.
There are some additional remarks in Chapter 3 that do not require explanations from Consortium.

2 COMMENTS

Comment No. 1:

It should be stated that report becomes effective after provision and comments are given by GEN energija. Comments shall be addressed, evaluated and resoluted by the Consortium before Final Report is submitted.

Comment No. 2:

In *Chapter 2, Subchapter 2.3.2.3 Discussion on the dating of the Plioquaternary sediments*, page 29-33 the age-dating methods within this project is provided for the Globoko formation ("PlQ gravel") and 3 alternatives for the PlQ age estimation are described.

Due to comment provided in the report:"Up to now, we consider not to have enough conclusive arguments to favor any of these 3 options." a question of best possible age-dating method arises. First method is still an experimental method, second method provides rough estimate and is based on many assumptions and third method is based on approximation and on certain unverifiable stratigraphic assumptions.

What method would have to be used to adequately asses the age of Globoko formation ("PlQ gravel")?

Comment No. 3:

In *Chapter 4., Subchapter 4.3 Libna fault as a source in seismic motion calculation, page 54-55* the range of fault length is presumed to be between 3 and 30 km, but two different lengths of Libna fault are addressed. Libna fault length of 5 km is completely consistent with the available data [3]. The length over 10 km is not possible due to Gorica (Gorajnci) and Orlica fault. The report in conclusion states that a scenario with a longer fault is also possible. In next paragraph the conclusion of 10 km long fault (which cannot be conclusively discarded) and associated magnitude ranges between 5.71 ± 0.23 ("Rupture Area relation" with L=10 and W=5) and 6.28 ± 0.28 ("Surface Rupture Length" relation, with L=10) are given.

What is the basis for the scenario with a possibility of a longer fault? On what basis or model is the magnitude for the presumed length of 10 km Libna fault build on? Is this basis or assumption made simply on the data of the width of the deformed zone on Libna and extrapolated on the length. What magnitudes would we associate with longer or shorter Libna fault? Explain the model used, lengths and associated magnitudes.

How does the PSHA and DSHA results change it capable fault with 6.28 magnitude is taken into account? What if the background in the PSHA is taken as 6.3 magnitude.

Comment No. 4:

In *Chapter 5 Conclusion* two topics that are inconclusive are presented, firstly that the data does not present distinguishing between the two alternative interpretations of the observed features, the aseismic and coseismic one and secondly, regarding age-dating method, which sheds doubt about the age of displacement along the Libna fault.

Is there a method that could be used to distinguish between two alternative interpretation: aseismic and coseismic?

Comment No. 5:

There should be no concerns regarding safety issue of the existing NEK NPP, since safety assessment of NEK is not included in the contract. NEK performed stress tests [2], which included earthquakes. The fragility analyses showed that there is significant safety margin, before PGA is high enough to threaten nuclear safety.
NEK is obliged to include all new information about seismicity of Krško basin in their reports (PSHA, USAR).

3 REMARKS

Comment No. 6:

In *Chapter 4, Subchapter 4.1 Libna fault as a capable fault, page 53,* the discussion on the potential implications of new findings for seismic hazard and capable fault issues arises where is stated that according to IAEA and NRC guidelines and according to the Consortium decision about the appropriate period for defining capability the age of deformed sediments alone is sufficient to state that Libna fault is capable.

What age of sediment is addressed here and the method used for evaluation?

Comment No. 7:

In *Chapter 4, Subchapter 4.4 Addressing the ambiguities on page 55* recommendation on further electrical mapping around trench 2 on the Libna hill is proposed.

Which new corrections or evidence will be gathered from this approach that could asses more than it is stated in the Appendix 4 Displacement modeling?

Can the slip rate be assessed from the results in 2009 and data from the trenches?

Comment No. 8:

In Chapter 4, Subchapter 4.4 Addressing the ambiguities on page 55 new trenches are proposed. According to the statement: "we may hope to ..." there is no guarantee to get some additional data and this leads to never ending project.

Comment No. 9:

In Chapter 4, Subchapter 4.4 Addressing the ambiguities on page 55 additional investigation (high resolution seismic survey) south of the Sava river on concerning the potential continuation of the fault is recommended.

Would this investigation adequately evaluate the length and constrain the geometry of the Libna fault? And would a clear data of Magnitude for Libna fault be submitted?

Comment No. 10:

In Chapter 4, Subchapter 4.4 Addressing the ambiguities on page 55 additional investigation (morphotectonic analysis) north of the Orlica fault on concerning the potential continuation of the fault is recommended.

Would this investigation adequately evaluate the length of the Libna fault?

4 CONCLUSIONS

The report is extensive, however some issues are still not closed: the length of Libna fault and the age of Globoko formation. There is no need to include conclusions about NEK in the report. It should be stated that report becomes effective after provision and comments are given by GEN energija and external reviewer. Comments shall be addressed, evaluated and resoluted by the Consortium before Final Report is submitted.

5 REFERENCES

[1] IAEA, SSG-9: Seismic Hazards in Site Evaluation for Nuclear Installations, Vienna, 2010, 60 pages

[2] SNSA, Slovenian National Report on Nuclear Stress Tests, 2011, 167 pages

[3] Rižnar, I., Koler, B. & Bavec, M. 2005: Identification of potentially active structures along the Sava River using topographic, and leveling line data (Identifikacija potencialno aktivnih struktur vzdolž reke Save na podlagi topografskih podatkov in podatkov nivelmanskega vlaka.) – Geologija 48/1, 107-116, Ljubljana.