




# GEOLOGICAL SURVEY OF SLOVENIA


Dimičeva ulica 14, 1000 Ljubljana, SI Slovenija

GEN

Vrbina 17  
8270 Krško

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Dear Mr. Novšak,

On January 24<sup>th</sup> we received a copy of the letter from IRSN to GEN regarding the possible implications of findings during investigations on the Libna Fault that were conducted by the Consortium BRGM-GeoZS-IRSN-ZAG in years 2008 through 2011. The survey has been performed within the framework of the study Geotechnical, Geological, and Seismological (GG&S) Evaluations for the New Nuclear Power Plant at the Krško Site (NPP Krško II).

Within the Consortium, GeoZs is responsible for the geological part of the study. For that reason we are calling your attention to an inconsistency in the abovementioned Letter. As first we are informing you that on Jan. 18<sup>th</sup> 2013, IRSN agreed to authorize the Paleoseismological trenches on the Libna Hill V7, Rev1 report with only a minor modification required, which do not affect any statements below.

In the Letter, IRSN states that the Consortium agrees on the capability of the Libna fault. Given the Report, this statement is not concise and should be placed into its appropriate context, as we state in the Report the following (Quote):

- *Libna fault is not an important structural element of the Krško basin. Moreover, from its geomorphic expression and its mapped length, it seems unlikely that it is a fault that is capable of generating earthquakes large enough to produce surface fault rupture. However, recent findings in the trench #2 at the Libna Hill indicate that the Libna fault may be described as capable if capability is defined in line with Safety guide SSG-9 (IAEA, 2010; where capability is not necessarily related to earthquakes on the fault of concern) and if the lower age-estimates of P1,Q formation are taken as relevant.*
- *Results were not conclusive regarding two topics:*
  - *The data does not allow distinguishing between the two alternative interpretations of the observed features in the trenches: the aseismic and the coseismic one.*
  - *Comparison of various age dates of the Plio-Quaternary sediments in the area gives inconsistent results, which sheds doubts about the age of displacement along the Libna fault.*
- *According to the current tectonic model, the potential displacement is not distributed evenly along the whole length of the Libna fault. It is concentrated mostly to differential folding*



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*along the Libna anticline and most deformation should be taken up there (on the Libna anticline).*

Thus, based on these ambiguities we (the Consortium) conclude regarding the capability of the Libna fault in section 4.4. of the Report as follows (*Quote*):

*The Libna fault may also be described as a capable fault and additional data and/or analysis are required because some important issues for the assessment of the potential impacts of the fault are still open.*

Moreover, to address the many ambiguities left unanswered, in the report, we proposed that the Client addresses these ambiguities with a series of new investigations such as:

- Investigating nature and amount of displacement
- Re-addressing the location and geometry of fault along with the details of the spatial pattern of the fault zone including its length
- Determining age of sediments. *An extensive and multi-method campaign of datings is required to conclude as there is no known single absolute dating method that would guarantee reliable age dating of the deformed sediments in trench on Libna and consequently the age of deformation.*

We, however also clearly state in the report that considering the strike-slip kinematics of the fault, we are aware that some of these tasks will be difficult to investigate and the results may not be conclusive, especially the data dealing with fault displacement and the age of the sediments. To the best of our knowledge, GEN has already started with certain new investigations based on this proposal.

Thus, it is opinion of GeoZS that the current state of knowledge on the issue of the Libna fault:

- does not meet the criteria to univocally define it as a capable fault (given the IAEA SSG-9) and
- does not fit the recommendation of NS-R-3 (*Quote*): "3.7. *Where reliable evidence shows the existence of a capable fault that has the potential to affect the safety of the nuclear installation, an alternative site shall be considered.*"

Assist. Prof. dr. Marko Komac, Director

