

Fontenay aux roses, August 9th, 2013

Le Directeur général

IRSN/DIR/2013-00525

REPUBLIKA SLOVENIJA
MINISTRSTVO ZA OKOLJE IN PROSTOR
UPRAVA REPUBLIKE SLOVENIJE
ZA JEDRSKO VARNOST
Železna cesta 16, P.O. 5759, 1000 LJUBLJANA

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L.V.

Mr. Andrej STRITAR

Director

Ministry of agriculture and the environment

Slovenian Nuclear Safety Administration

Litostrojska cesta 54

1000 Ljubljana

Slovenia

Objet : Clarifications concerning information published on the SNSA website and the May 2013 issue of Slovenian Nuclear News

Dear Mr. Stritar,

IRSN participated last April to the meeting organized at your request in Ljubljana in order to clarify geological issues at the Krško site. Following this meeting, comments and conclusions were published on the SNSA website as well as in the May 2013 issue of Slovenian Nuclear News (see Appendix). After careful reading of these texts, I would like to draw your attention to some elements that I think would deserve some modification or additional clarification.

Concerning the published conclusions on the capability of the fault and its potential impact on the Krško 1 Nuclear power plant, IRSN does agree that PFDHA method is acceptable for assessing the risk of displacement at the location of the plant if it is supported by sufficient data, especially issued from local investigations. As stated in the April meeting, IRSN recognizes that the results obtained by P. Rizzo are reassuring with regard to the safety of the plant; IRSN is however not in a position to validate or invalidate these results since its experts have not been involved in the PFDHA study nor had the mandate or opportunity of reviewing it. I accordingly consider that the corresponding statement published in Slovenian Nuclear News does not correspond to the position expressed by IRSN during the meeting [see: "the Consortium agreed that even if we assume the capability of Libna

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fault, its impact is small and the input data for seismic design of the existing NPP Krško need not be changed”].

Concerning the possible need to revise the input data for the seismic design of Krško 1 plant, IRSN acknowledges that contrarily to the article in the Slovenian Nuclear News, SNSA communication on the website adequately reports IRSN’s expert position, expressed during the April meeting, that there are grounds to update the 2004 PSHA study that form the basis for establishing the level of seismic hazard to be considered. IRSN confirms that, according to the preliminary studies carried out within the framework of the Krško 2 project, the question of updating the 2004 model is raised and should be investigated further. This issue has been recently discussed with GEN as exposed further below.

Finally, SNSA website mentions that no clear indication was given by IRSN experts during the April meeting on the ways to tackle the issues raised by the results of the geological investigations. In order to further clarify these issues, a meeting was held in Vienna on July 3rd, 2013 between M. Martin Novšak, Director of GEN, and M. François Besnus, Director of Waste and geosphere at IRSN. Concerning the PFDHA studies, IRSN has suggested that, in order to consolidate P. Rizzo’s conclusions, GEN makes sure that the PFDHA results obtained is supported by sufficient data, especially the local data presented in the Libna report and its appendices, so that the uncertainties related to the method are reasonably constrained. A new peer review could be appointed so as to include the results of the investigations still ongoing. Concerning the updating of the 2004 PSHA studies, IRSN has recommended that a cautious approach be implemented, based on data acquired and preliminary PSHA studies realized during the Krško 2 project but refined and possibly complemented by other methods (comparison of deterministic and probabilistic methodologies, refinement of the earthquake catalogue...) as was initially envisaged for the second phase of the project (see minutes appendix). Another approach would be to initiate a “SSHAC level 3” process that has proved useful for conciliating the various expert opinions on seismic hazard assessment.

I wish to inform you that IRSN has no intention to participate to the tasks that the above suggestions may entail, if it was decided to implement them. I also want to inform you that, in order to facilitate the possible follow-up of the assessment of the seismic risk at Krško site, all the relevant data, results and studies that IRSN has acquired or carried out during the Krško 2 project have been forwarded to GEN Energija.

I sincerely hope these clarifications will lead to constructive approaches for solving the questions that may still arise concerning the assessment of the seismic hazard at Krško site,

Best regards,



Jacques REPUSSARD

Appendix

Translation of SNSA web site: Downloaded on the July 18th, 2013 from

http://www.ursjv.gov.si/si/info/posamezne_zadeve/o_potresni_varnosti_nek/

THE SEISMIC SAFETY OF THE KRŠKO NPP

15 MARCH 2013

The Director of GEN Energija, Mr Martin Novšak, verbally informed the Slovenian Nuclear Safety Administration (SNSA) on 25 January 2013 about a letter from the French IRSN Institute on the seismic safety of the Krško site. In the interest of the public, on this web site we publish all the documents received or sent by the SNSA in connection with this issue in chronological order. We published a summary of the genesis of this issue as a news story on 15 March 2013.

DATE OF RECEIPT OF THE DOCUMENT (with the date of creation):

11 March 2013, Dopis GEN Energije d.o.o. (27 February 2013)
11 March 2013, Pismo inštituta IRSN podjetju GEN Energije d.o.o. (9 January 2013)
11 March 2013, Odgovor GEN Energije d.o.o. (26 February 2013)
11 March 2013, Študija Geološkega zavoda Slovenije o raziskavah na Libni (April 2011)
11 March 2013, Mnenje podjetja Paul C. Rizzo Associates (25 June 2012)
11 March 2013, Tehnično poročilo GEN Energije d.o.o. o pismu IRSN (19 December 2011)
11 March 2013, Mnenje recenzentov o PFDHA (20 January 2013)
11 March 2013, Poročilo podjetja Paul C. Rizzo Associates (15 February 2013)
11 March 2013, Pismo Geološkega zavoda Slovenije (13 February 2013)
11 March 2013, Pismo inštituta BRGM (19 February 2013)
15 March 2013, Obvestilo za javnost URSJV
18 March 2013, Dopis URSJV GEN-u (18 March 2013)
20 March 2013, Dopis URSJV ARAO (20 March 2013)
21 March 2013, Dopis URSJV NEK-u (21 March 2013)
28 March 2013, Dopis ZEG - Obvestilo za javnost (26 March 2013)
29 March 2013, Dopis URSJV IRSN-ju (29 March 2013)
29 March 2013, Seznanitev z IRSN pismom in odgovorom - dopis GEN-a URSJV (27 March 2013)
29 March 2013, Poročilo Paleoseismological investigations of the Libna fault. Trench in Stari Grad (27 November 2008)
29 March 2013, Geotechnical, Geological, and Seismological (GG&S) Evaluations - NEK
29 March 2013, Članek revije Earth Science Reviews (založnik Elsevier): The relationship between displacement and length of faults: a review (2005)
2 April 2013, Pismo Martina Brataniča URSJV (2 April 2013)
8 April 2013, Pismo URSJV Gen-u (8 April 2013)
9 April 2013, Vabilo na sestanek s člani konzorcija (8 April 2013)

26 APRIL 2013 - *Working meeting with representatives of the Consortium in Ljubljana*

Agenda

Note of the meeting (GEN)

Presentation slides

Uvodna predstavitev dr. Andreja Stritarja

Namen in obseg naročenih študij - J. Špiler, GEN

Raziskave v sklopu konzorcija - Bazargan-Sabet Behrooz, BRGM

Prelom Libna - M. Bavec, GeoZS

Predstavitev IRSN

Geologija, tektonika in seizmotektonika Krškega polja - M. Bavec, GeoZS

Karakterizacija preloma Libna - M. Cline, Rizzo

PFDHA analiza - R. Quittmeyer, Rizzo

Position of the SNSA after the working meeting

On Friday, 26 April, GEN energija, on the initiative of the SNSA organised a working meeting in Ljubljana of the members of a Consortium that has over the years studied the suitability of the site in the Krško area for a possible second nuclear power plant. The meeting was attended by representatives of all members of the Consortium, namely France's BRGM and IRSN institutions, the Geological Survey of Slovenia (GeoZS) and the Slovenian National Building and Civil Engineering

Institute (ZAG). Other participants included representatives of the U.S. company P. Rizzo, the Krško Nuclear Power Plant, GEN energija, the Faculty of Civil Engineering (FGG), the Agency for Radioactive Waste Management (ARAO) and the Slovenian Nuclear Safety Administration (SNSA). The meeting was expected to provide information on the work of the Consortium and try to clarify differences in the technical interpretations of the findings of the research. An important reason for the meeting were the questions raised by a letter from the IRSN Institute to the company GEN energija in January this year. We were informed that in the meantime the IRSN had withdrawn from the Consortium.

At the beginning of the meeting the director of the SNSA, Dr Andrej Stritar, presented three key issues that have crystallized within the SNSA in recent months in the wake of the review and analysis of the documents received and to which he expected to get answers. These issues were as follows:

1. How was quality assurance ensured during the work of the Consortium as it is not clear from the documents received that all the members of the Consortium approve of them or that the documents have been properly revised or reviewed? The SNSA has not received any joint reports from the members of the Consortium.
2. What do the results of their research mean with regard to input data for the antiseismic design of the Krško Nuclear Power Plant? Will the design accelerations and design spectra, as the basis for the design of the buildings and technological systems, change? Does the possibility of a Libna Hill fault pose an imminent threat to the movement of objects on the site?
3. If the input data from the previous question do actually change, what will it mean for the antiseismic safety of the Krško NPP? This question is not really intended for the Consortium, but for the Krško NPP.

After the meeting, the SNSA understood the current situation as follows:

1. The participants agreed that there were indications that a Libna Hill fault was possible, but they did not agree on the extent to which this was certain mainly due to data on the dating (age determination) of the Plio-Quaternary deposit, which is unreliable and significantly changes the current knowledge of the age of this sediment in the Krško basin. An important point was also that participants agreed that even if the possibility of a Libna Hill fault rupture was assumed, its impact would be so small that it would not change the seismic source considered in evaluating the seismic safety of the Krško Nuclear Power Plant
2. The IRSN did not explain in detail why they felt the need to emphasise their understanding of the issue of the Libna Hill fault in a separate letter. When asked directly what should be done regarding their warning concerning the Libna Hill fault, the IRSN provided no clear answer. They believe, however, that it is necessary to review the methodology for calculating the total seismic load irrespective of the possibility of a Libna Hill fault.
3. The participants agreed that the new findings did not suggest a major immediate danger due to the potential formation of cracks on the surface. They agree that a PFDHA (Probabilistic Fault Displacement Hazard Analysis) is a suitable tool for assessing potential ground movements on the site of the facility.
4. The representatives of the P. Rizzo company presented the preliminary results of a PFDHA study they are conducting for GEN energija. The calculation methodology takes into account the effects of all the faults in the wider area around the site, including the Libna Hill fault. The findings that the probability of movements of terrain that can affect the structure and thus the safety of the power plant is well below the level of existing risk due to power plant operation are reassuring.

The SNSA will closely follow the continuing research and clarifications of ambiguities, which have been anticipated by both GEN energija and the Krško NPP. In the next few months they will try to obtain harmonised positions from the members of the Consortium.

The SNSA is of the opinion that on the basis of current knowledge there is no reason to take any immediate action in relation to the antiseismic safety of the Krško NPP. In the long term, the SNSA particularly insists on the Krško NPP constantly improving its capacity to cool the reactor core in any situation and making arrangements for the delivery of the necessary electricity and water to support the cooling systems in such situations. This is the focus of the Safety Upgrade Programme, which we requested in 2011 and according to which by 2016 the Krško NPP should have incorporated almost everything that is known today about ensuring the preparedness of nuclear power plants to withstand severe external events, including the worst earthquakes.

The SNSA's follow-up activities

26 April 2013, Dopis Direktorata za energijo

13 May 2013, Odgovor URSJV Direktoratu za energijo

17 May 2013, Vabilo na sestanek z GEN, NEK in ARAO

24 May 2013, PFDHA študija

Note of the SNSA meeting on 27 May 2013

The purpose of the meeting was to inform the SNSA of the planned follow-up activities and to provide measures based on the results of the meeting of 26 April 2013 with the members of the Consortium, BRGM, IRSN, GeoZS and ZAG with regard to the issue of the Libna Hill fault.

Participants: Representatives of the Slovenian Nuclear Safety Administration (SNSA), GEN energija, the Krško NPP and the Agency for Radioactive Waste Management (ARAO)

At the beginning of the meeting GEN energija introduced a project for geological, geotechnical and seismic surveys carried out since 2007 by a Consortium led by the BRGM. GEN is now debating terminating the contract with the Consortium because the IRSN has already withdrawn from the Consortium in January 2013 on its own initiative.

During the implementation of the contract, two annexes were added to it for the implementation of additional seismic profiles, additional wells, geophysical surveys and an additional laboratory analysis. During the implementation of the contract with the Consortium, GEN also entered into a contract with the company Rizzo for the review of the Consortium's reports. Subsequently, it also made arrangements with Rizzo for conducting geomorphological surveys by using LIDAR DMV, the determination of high resolution seismic profiles and the determining of the age of the Plio-Quaternary sediment. The age of the sediment will be determined by using optically stimulated luminescence (OSL) and "Cosmogenic Radionuclide" dating (CRN). Measurements and opinions on measurements will be obtained from accredited laboratories (Bern, Purdue University Prime Laboratory and Utah State University). The estimated time of the completion of the additional surveys is the end of 2013. GEN has also ordered a PFDHA analysis from Rizzo, as well as a sensitivity analysis with conservative assumptions, the preliminary results of which were presented at the meeting held on 26 April 2013.

The results of the surveys to date do not necessitate immediate action as the seismic safety of the Krško NPP is not compromised. Nevertheless, the planned surveys should be completed.

The SNSA pointed out that before the end of the contract with the Consortium it would be useful to obtain adequately harmonised and signed reports on the work performed from its members. Preferably, the reports should specify what they agree on, as well as what they do not agree on. The SNSA recommends that the members of the Consortium confirm in writing the view expressed at the meeting on 26 April 2013 that the impact of the Libna Hill fault, if it is capable, is so small that it would not change the seismic source taken into account in assessing the seismic safety of the Krško NPP.

A proposal by a representative of the IRSN from the meeting of 26 April 2013 that the Probabilistic Safety Hazard Analysis (PSHA) completed for the Krško NPP in 2004 should be repeated was also addressed. The participants agreed (the same conclusion also follows from presentations by the other members of the Consortium at the meeting of 26 April 2013) that there was no new confirmed geological information that would significantly change the geotectonic profile of the Krško basin that was used as input information for the 2004 PSHA. In addition, it would be better to wait with repeating the PSHA because international debates on corrections to the applied mathematical models and assumptions are still in progress. It would make sense to repeat the PSHA in a few years when changes to the models are agreed upon and become standard practice and when there is new seismic data available on the Krško basin. During the review of the PSHA the Krško NPP should also reasonably take account of the recommendations made by the IRSN in 2004.

The Krško NPP informed the participants that by the end of June 2013 it would prepare an analysis of the response of the Krško NPP to the PFDHA and would send it to the SNSA along with an independent expert opinion to be prepared by the FGJ from Ljubljana (Prof. Fajfar).

The ARAO stressed that the safety analyses for the future disposal site for low and intermediate level waste (LILW) have already incorporated a scenario in which shortly after the closure of the disposal site the technical barriers are torn down and damaged, which also includes an earthquake event. This means that the technical barriers will lose their property of physically retaining radionuclides, while maintaining the chemical retention (sorption) property. Even in this case analyses and evaluations do not indicate a radiological impact of the disposal site that would be above the permissible limit.

Conclusions:

- The SNSA expects GEN to obtain signed final reports from the Consortium and to try to obtain a written statement from the members of the Consortium as to the impact of the Libna Hill fault, even if it is capable, on the input data used in the PSHA.

- GEN will complete the characterisation of the Libna Hill fault with its contractual partner by the end of 2013. The age of the Plio-Quaternary deposit will have also been determined by then.
- If a need arises, the Krško NPP will carry out PSHAs in a few years, once the geological surveys have been completed and, if necessary, once the seismotectonic model of the Krško basin and surrounding area has been revised and the revised methodology for such analyses has been reviewed and made available.
- In its safety analyses for the disposal site for radioactive waste the ARAO must also take into account any new facts regarding likely seismic events that have and will be obtained through surveys conducted by GEN energija.

New reports

- July 2013, Final Technical Report - Sensitivity Analysis PFDHA (28 June 2013)