Dipl.Ing. Dieter Majer
Head of Directorate (retired)
Junkernstr. 32
65205 Wiesbaden
Tel.: +49 612 214 225
Mobile: +49 1522 203 5959

Wiesbaden, August 2013

Potential weak spots in the primary circuit in Block 1 of the Temelin nuclear plant in the Czech Republic

Short advisory statement on behalf of the Alliance 90/The Greens parliamentary group in the Bundestag

Contents

Summary

Summary

In the year 2000, a witness informed Greenpeace that there had been a problem during the construction work on Block 1 at the Temelin nuclear power plant. The witness said that a pipe had been welded directly onto the reactor pressure vessel the wrong way up, and that the welding team subsequently cut the pipe off at the welding seam, which is crucial to plant safety, and re-welded it onto the vessel without due consideration of the regulations on producing welding seams. If this allegation proves to be true, it would mean that there is a considerable risk of the welding seam breaking, especially if an accident occurs, and therefore of radioactive materials being released into the environment.

The plant operator CEZ, and the Czech State Office for Nuclear Safety (SUJB) continue to deny that any such incident happened at Temelin. In the years since the allegations were made, Greenpeace and a number of individuals have been working hard to clarify the facts of the case with both the plant operator and the Czech nuclear regulatory authority. To this day it remains unclear whether the witness was right about welding taking place against regulations. Both the operator and the SUJB have tied themselves up in all manner of contradictions. Most recently, it was admitted that the necessary documentation only exists in part. Because the clearly deficient documentation has not been publicly available, considerable doubt remains as to whether the welding seam fulfils the necessary quality requirements. Even the reports published on expert investigations conducted in 2001 and beyond are not able to prove whether the seam is of a high enough quality.

Based on the facts as they are currently known, the existing documentation is incomplete. Irrespective of whether or not Welding Seam 1-4-5 was cut as Greenpeace's witness says it was, there is reason to believe that none of the welding seams in the connection area of the reactor pressure vessel comply with the required quality standards.

The only way to prove that they comply is for the State Office for Nuclear Safety to publish all the necessary documents and for these to be reviewed by an independent expert who has no connection to the SUJB or the operator. Based on these inspections, a decision would then have to be reached on whether further non-destructive materials testing on the welding seam would be enough to establish compliance with the necessary quality standards, or whether the seam should be re-welded in line with the applicable rules.

1 What key statements can and cannot be made on the basis of the documents currently available on the (lack of) security of Welding Seam 1-4-5 in Block 1 of the Temelin nuclear power plant?

1.1 The facts according to the documents currently available and to information gathered in various meetings

In a document on the Temelin nuclear power plant published in 2006, Greenpeace alleges that a particular welding seam in Block 1 of the plant does not conform to the applicable regulations and that Block 1 therefore poses a serious nuclear risk. **According to Greenpeace (writing in 2006), the situation is as follows ([1], page 8 ff.):**

1. In July 2000, an anonymous witness[1] approached Greenpeace Czech Republic and said that, while working on the Temelin plant, he had been involved in repairing a welding seam between the primary cooling circuit and the reactor in Block 1 of the plant. In his statement, he said that a pipe had been welded the wrong way up and was therefore inverted by 180°. This only came to light once the welding on the pipe was nearly finished. Subcontractor Modranská potrubní a.s. then ordered the welding team to cut through the seam on the reactor vessel, turn the pipe the right way up and then weld it back on again. The witness claims that the associated documentation was amended to cover up what had happened. He also says that the welding was carried out in violation of technical regulations and that the companies responsible – the subcontractor Modranská potrubní a.s. and the main contractor Škoda Praha a.s. – reached a mutual agreement to keep the incident a secret. At the request of the police, CEZ and SUJB, the Greenpeace witness indicated the location of the welding seam on a map provided by CEZ. The information was handed over to SUJB on 22 September 2000, during a meeting between Jan Haverkamp and Jiří Tutter of Greenpeace, and SUJB president Dana Drabova and SUJB inspector Jana Kroupova. SUJB later said that the welding seam in question was Weld 1-4-5.[2]
2. On 28 August 2000, Greenpeace brought charges for endangering the public and for suspected fraud concerning the documentation of welding work. It was after this that the České Budějovice police force began investigating the allegations. As part of the investigations, an external team of experts from Prague carried out an independent analysis of the welding seam in question. Greenpeace had not given the police any information as to which welding seam the witness had indicated. This must have come either directly from SUJB or indirectly from it, via Modranská potrubní a.s., Škoda Praha a.s., or CEZ. The independent investigators examined Welding Seam 1-1-5. Welding Seam 1-4-5 was neither considered nor analysed. This information led the České Budějovice police to reopen the case in mid-January 2002. However, for reasons that were not clear, the investigations were suspended again in mid-2003. Public prosecutors made a number of attempts to have the case reopened, but they were all quickly blocked.
3. At the first meeting between SUJB and Greenpeace on 29 August 2000, SUJB indicated that the witness had confused Weld 1-4-5 with a similar incident that had occurred on Pipe 1, Weld 1-1-6, which was not in the vicinity of the reactor but in the assembly hall. SUJB said that the repair work carried out there was well-documented and complied with the applicable regulations. Greenpeace questioned the witness on this theory, but he firmly rejected the idea that he was talking about the 1-1-6 case. Greenpeace informed SUJB of this.

[1] Witness' name and address are known to Greenpeace CZ.

[2] The code is constructed as follows: the first digit refers to the reactor block, the second to the pipe, and the third to the welding seam. So, in this case the code refers to Temelin Block 1, Pipe 4, Welding Seam 5.

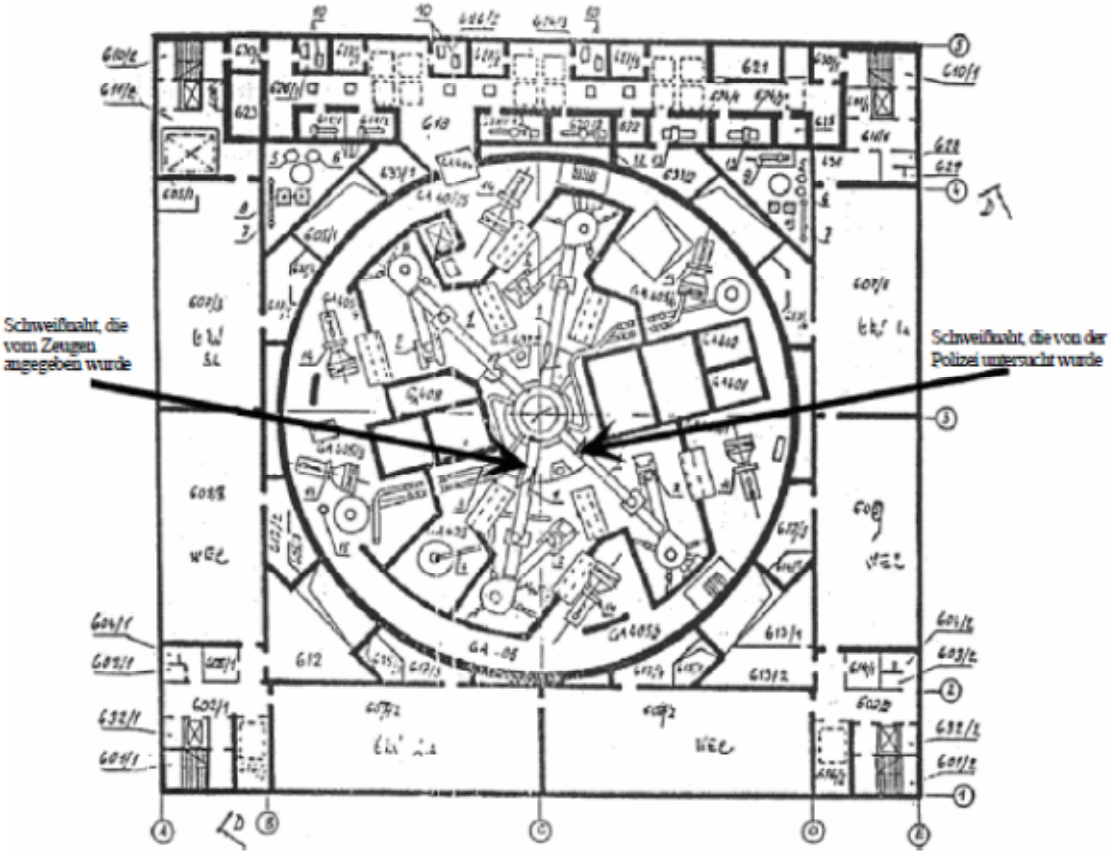
4. Greenpeace organised a number of meetings between the witness and international experts. Partly on request and partly on its own initiative, Greenpeace arranged two telephone calls and a meeting in person (during which the witness remained anonymous) with the engineer Jana Kroupova, the inspector responsible for the case at SUJB. During these occasions, Ms Kroupova said that she was keeping the SUJB management up to date with the details of the meeting and telephone calls. All of the experts involved, including Ms Kroupova, came to the conclusion that far from simply trying to make trouble, the witness was entirely believable. His statements appeared to be convincing.
5. During a meeting between Greenpeace and SUJB held on 4 October 2001, SUJB president Ms Drabova and the engineer Petr Brandejs, director of the nuclear installations control division, both said that by May 2001 Modranská potrubní a.s. had provided SUJB with full documentation for all the welding work that had been carried out on the primary circuit. They confirmed this information when asked whether anything had changed since a statement by the SUJB management had been submitted to Greenpeace on 9 January 2001. In the statement, the engineer Pavel Böhm, deputy chair of reactor safety at SUJB, declared that the documentation contained formal and factual errors and had not been submitted in its entirety. Mr Böhm went on to say that the task of assembling the pipes for the reactor had not complied with the usual technical regulations. The statement was confirmed in the first-quarter report that SUJB submitted to the Czech government in 2001.
6. However, at the meeting on 4 October 2001, Mr Brandejs and Ms Drabova said that they had all the documentation and that everything was in order. They claimed that in the cases where discrepancies were found, SUJB requested that CEZ carry out additional checks and that the corresponding reports were produced by an independent consultant, Prof. Jaroslav Němec. The checks involved analysing the documentation and doing functional testing on the welding seams close to the alleged repair work on Pipe 1-1 (Welding Seams 1-1-6 and 1-1-6a) and on two welding seams near the circulation pump on Pipes 3 and 4 (Welding Seams 1-4-11 and 1-3-8). Mr Brandejs and Ms Drabova added that, although it was not expressly mentioned in the report, the checks also included Prof. Němec conducting a full analysis of the documentation. Apparently, no special attention was paid to Welding Seam 1-4-5 and it was also not the focus of functional testing. Ms Drabova and Mr Brandejs refused to say who had carried out the tests – allegedly because they did not know who had done them. They did, however, claim that the tests had been carried out well.
7. Nevertheless, according to information from a source linked to Modranská potrubní a.s., there is absolutely no doubt that the documentation on this case, which SUJB had received from Modranská potrubní a.s. by 5 October 2001, was still incomplete and did not comply with the technical regulations. The source also said, “What you know now is only a fraction of what really went wrong”.
8. The same source claimed that it was actually employees of Modranská potrubní a.s. and CEZ who carried out the tests for Prof. Němec’s report, and that SUJB was aware of this.
9. At the meeting between Greenpeace and SUJB on 4 October 2001, SUJB president Ms Drabova and SUJB inspector Mr Brandejs said that the documentation contained no discrepancies relating to Welding Seam 1-4-5,

and that this was the first they had heard of a witness telling Ms Kroupova about that welding seam – despite Ms Drabova being present at the meeting where this happened. Further, Ms Drabova and Mr Brandejs claimed to know nothing about the two telephone calls and the face-to-face meeting between Ms Kroupova and the witness. Instead, they said that they only knew about one of the telephone calls (see Point 4 for Ms Kroupova's opinion). During the meeting on 4 October 2001, Ms Kroupova confirmed that she had been informed of the welding seam in question and that she had passed the information on to the SUJB management.

10. On 28 June 2001 Greenpeace officially requested SUJB access to the results of the investigation into the welding seams. This was refused on a number of occasions. In the final refusal, SUJB president Ms Drabova wrote on 12 October 2001 that Mondranke a.s. **did not carry out a check** that focused on any particular one of the welding seams on the 850 DN pipes in the primary cooling circuit in Block 1, and that it was therefore impossible to provide the requested material (as Greenpeace's Jiří Tutter explains, this refers to the inspection report). She said that the welding of the 850 DN pipes in the primary cooling circuit in Block 1 of the Temelin nuclear power plant was only checked in Temelin, and the corresponding inspection reports were only written there. This is **not true. SUJB is trying to cover up a report that was drawn up by its own inspectors**. The following facts prove that this is the case (for details, see [1] in the references, Page 11 ff.):
11. In 2002 and 2003, SUJB admitted that a report did exist on the investigations into the welding done in Block 1 of the Temelin power plant. After Greenpeace issued a request in April 2003, SUJB published parts of the inspection report (**43/20013**). The report shows that a number of welding seams were investigated. **Welding Seam 1-4-5, however, does not feature in the report at all.** Furthermore, the report reveals several serious errors in documenting welding work elsewhere. These facts were passed on to Prof. Němec so that he could carry out an independent check. Report 43/2001 and the report compiled by Prof. Němec come to the same conclusions. One problem, however, was not referred to Prof. Němec for assessment. Rather, the plan was to investigate it when the fuel rods in Block 1 were replaced for the first time. This was carried out between February and April 2003. There are no graphical analyses of Welding Seam 1-2-5. As far as Greenpeace is aware, no checks have been done to explore the possibility of these analyses having been shifted to replace analyses of Welding Seam 1-4-5, which may have been destroyed. Neither Greenpeace nor the media received information on physical tests done on Welding Seam 1-2-5. The reports for the first and second quarters of 2003 also make no mention of any such tests.
12. Speaking in an interview on Czech radio on 22 April 2003, Ms Drabova told Greenpeace that a full inspection report had been available previously. According to information that Greenpeace received prior to this from the Ministry of the Environment and Information, Ms Drabova must be referring to Inspection Report 15/2001. Ms Drabova said that a complaint lodged by the contractor led to this report, and all associated evidence, being destroyed. The inspectors charged with the investigation were said to have "acted illegally" by investigating irrelevant (i.e. unimportant) points. She did not explain why these issues were not mentioned in earlier correspondence. Since various witnesses have told Greenpeace that Report 15/2001 contained information on problems with Welding Seam 1-4-5, it can be assumed that SUJB must have classified

the problems as being irrelevant. Given the gravity of these allegations, Greenpeace believes that this case represents a direct violation of the Atomic Act.

13. The analysis of the subsequent Report 43/2001 shows that SUJB did not use its own welding experts to produce this report. The two SUJB inspectors are not experts on welding, and the report is based on the work of an external expert. The opinion of SUJB's welding experts, which presumably featured in Report 15/2001, does not appear in this later document. It should be noted that Greenpeace only acquired access to the full 43/2001 report after filing a request with the Ministry of the Environment. SUJB had given Greenpeace a redacted version of the report's summary and provided no information as to who was responsible for the report.
14. In 2005, during an extended period where Block 1 was shut down to allow the fuel rods to be replaced, CEZ carried out a new round of inspections on the welding seams. Once again, no attention was paid to Welding Seam 1-4-5, and yet the inspections did find that the seams had continued to deteriorate in quality. In this case, as before, neither CEZ, nor Škoda, nor SUJB took the necessary steps. The inspection and results were kept completely secret from the public.



This is a copy of the diagram that SUJB received during a meeting held on 22 September 2000 and attended by SUJB president Ms Drabova and the inspector Ms Kroupova. The black arrow on the left indicates the weld that the witness identified. The one on the right shows the weld that the police investigated.

The conclusions that Greenpeace has drawn from the facts that became known to it in 2006 and from the witness statements can be found in [1], Page 5 ff.

The following are key points made in those conclusions:

"Temelin cannot be considered safe.

SUJB cannot refute Greenpeace's allegations.

By refusing to publish incriminating material, by diverting attention away from the issue and by releasing information that is scientifically wrong, the SUJB management is actively involved in trying to cover up the details of this case.

In view of the existing information and its implications, SUJB should not have been allowed to grant authorisation for installing fuel rods in Block 1 at Temelin, for using it in test mode and for putting it into commercial operation.

The facts that have come to light prove that the control procedures for quality assurance and reactor safety failed at every level – right up to and including the "independent" State Office for Nuclear Safety.

To avoid any other violations of the law, both blocks of the Temelin plant should be put out of operation immediately.

The main contractor, Škoda a.s., and the subcontractor responsible for the welding work, Modranská potrubní a.s., cannot be trusted. They are both responsible for suspected illegal repair work, and for the ongoing attempts to cover up any evidence that this work took place.

The operator of the Temelin plant, CEZ, was also involved in the cover-up."

What follows is a list of other important details regarding the quality of the welding seams on the Temelin reactor pressure vessel in general, and the quality of Welding Seam 1-4-5 in particular. Full details of the sources can be found in the references section. The German translations ([1], [3], [4], [5], [6], [9], [10], [11]) were commissioned by the Alliance 90/The Greens parliamentary group in the Bundestag and prepared by the Language Service of the German Bundestag. The original Czech texts come from the official websites of SUJB (the regulatory authority) and CEZ (the Temelin operator).

Prof. Jaroslav Němec (expert at the regulatory authority SUJB) wrote to Dana Drabova on 29 June 2001, confirming that tests were carried out on Welding Seams 1-1-6a, 1-4-11 and 1-3-8. He makes no mention of Weld 1-4-5. [4]

During the informational meeting in Passau **on 12 June 2012**, when asked to make File 15/2001/SUJB publicly available, **Ms Dana Drabova told SUJB** that "File 15/2001/SUJB would not be suitable for the public." [2]

Speaking personally to Ms Artmann (The Greens, Wunsiedel) prior to the hearing in Budweis, **Dana Drabova said on 22 June 2012**: "The public would not understand File 15/2001/SUJB. It is a collection of various documents." [2]

On 22 September 2012, during a meeting at the Temelin nuclear plant, witnesses heard **Dana Drabova say:** "SUJB does not have the file (i.e. File 15/2001). CEZ does." [2]

On 22 September 2012, Milos Stepanowsky, head of the Temelin plant, said: "The file that CEZ has concerning the repair on Welding Seam 1-4-5 can be viewed by experts, but not by Jan Haverkamp." [2]

E-mail from Dana Drabova to Ms Artmann, sent on 14 October 2012: "There is no File 15/2001. It never existed as an official SUJB document." [2]

Quote from Ms Dana Drabova (date unknown): "The State Office for Nuclear Safety did not interfere in the process during which the police force of the Czech Republic decided who would carry out the investigations and where and how they would be conducted. The inspectors only provided the Czech police with the explanations requested. The State Office for Nuclear Safety and the police force of the Czech Republic conducted their investigations entirely independently of each other. And I think that is exactly as it should be." [3]

In a statement that the State Office for Nuclear Safety (SUJB) issued on the problems with the welding seams in the DN 850 primary pipeline at the Temelin nuclear plant [5] (date unknown), SUJB said, among other things, that:
"the documentation provided has a number of flaws, chiefly of a formal nature. These flaws concern both the method of documentation relative to the legal documents that were applicable at the time the work was carried out, and the legal regulations that were in force in 2001.
Ultimately, nothing was found to indicate that the documentation – even though it was not always prepared in full – had been falsified. Since the State Office for Nuclear Safety could not, on the basis of the inspections, definitively conclude that the written documents were complete enough to be able to confirm beyond doubt the service life and reliability of the welding seams in the DN 850 pipeline, it convened an expert meeting on 10 May 2001, during which the participants agreed the procedure for conducting follow-up checks and inspections.
The weld that was the target of criticism from the outset, 1-1-5, was analysed extensively during the police investigations."
This statement makes no mention of Welding Seam 1-4-5. Instead, it presents Welding Seam 1-1-5 as being the problem.

A concluding statement on the problems with the welding seams on the DN 850 primary pipeline in the Temelin nuclear plant [6] (date unknown) makes no mention of Weld 1-4-5. It also does not single out any other welds for particular attention.

The e-mail that the Bavarian State Ministry for the Environment sent to Ms Artmann on 30 November 2012 [8] says, among other things:
"During the meeting of the German-Czech Commission on 12 November 2012, it became clear that the experts present agreed to recommend that no special, elaborate inspection of the welding seam in question should take place. The Czech side pointed out that the statement Ms Drabova made in Wunsiedel was not to be understood as a general invitation to conduct inspections, but rather as indicating

that the German regulatory authorities would not be denied an additional inspection if they felt this to be necessary.
All German experts present, including those from the Society for Reactor Safety (GRS), agreed that the Czech regulatory authority had dealt with the concrete suspicion of faulty welding responsibly, properly, consistently and in line with the latest scientific practices. Given the technically sound procedure presented, there is no indication or doubt that would make it seem advisable or even necessary for German regulatory authorities and experts to conduct another elaborate inspection. In view of Czech sovereignty, the German Federal Ministry for the Environment believes that there is no question of German regulatory authorities embarking on another round of the comprehensive inspections that the Czech regulatory authority has already carried out.
Bavaria feels that the federal ministry has adopted a clear and logical position on this matter."

A letter that the German Federal Ministry for the Environment wrote to Sylvia Kotting-Uhl, a member of the German Bundestag, on 28 November 2012 [7] contains the following statement: "… the welded-seam issue was discussed extensively at this year's meeting of the German-Czech Commission (DTK) on 12 November 2012. According to our information, the Czech side stressed that it had not issued any invitations concerning specific events to hold expert discussions or to conduct bilateral inspections. When allegations were made that a weld (1-4-5) between the reactor pressure vessel and the primary circuit had been carried out, i.e. repaired, without authorisation and without being properly documented, the regulatory authority SUJB is said to have responded by arranging an inspection, which found that parts of the documentation were flawed. All welding seams in the primary circuit were then inspected again, by expert organisations, and the findings were reviewed by independent experts. These inspections, which were carried out between 2000 and 2006, apparently found no unlawful welding seams or repairs, and no defects in the quality of the welds themselves.

The German side was told that if they had any doubts about the procedure applied by the Czech authority, the Czech side would ultimately not prevent Germany from taking up the closed case itself.

After conducting an expert review of the Czech statement and after reviewing the existing documents from the period in question, the German Federal Ministry for the Environment believes that there are no safety issues that would provide reason for casting doubt on the Czech side's inspections. There are therefore also no grounds that would justify an intergovernmental debate on the incident."

Table 1 of a summary report on the review of the welding seams connecting the primary circuit's main circulation pipeline to the reactor pressure vessel at the Temelin nuclear plant [9] (date unknown) shows that Welding Seam 1-4-5 was reviewed by Mr Janovec in 2001. According to the findings, none of the welding seams assessed were found to be in violation of safety requirements, and there were

no signs of any unauthorised interventions in the technological process of the welding work.

From SUJB's answers to "Respekt" magazine, 26 April 2002 [11]:

"Alongside the largely positive findings, the inspections identified the logs concerning Welding Seam 11 on Loop 2 and Welding Seams 8, 11 and 13 on Loop 3 as not matching the facts, i.e., as not satisfactory. The State Office for Nuclear Safety (SUJB) has therefore required the permit holder to submit the results of the new evaluation of noted discrepancies and their assessment before the start of the active testing stage, and to inform the SUJB about the type of repair.

The supplier-side inspection revealed several flaws in the documentation regarding the welding procedure on the main coolant pipe, as well as several inconsistencies in the documentation. The inspection at the permit holder's showed that some of findings gathered on the supplier side could be either explained or refuted. Nevertheless, this check also demonstrated that the documentation regarding the welding work contains several mistakes, i.e., that it does not fully comply with the given quality assurance requirements.

As required by the SUJB's management, inspection of the documentation of the welding procedure pertaining to all assembly welds on Block 1's main coolant pipe (a total of 53 such welds on this pipe), as well as selected production welds, commenced at the permit holder's premises on 29 May 2001, as did inspection of part of the accompanying technical documentation and of adherence to the specified assembly procedure for the main coolant pipe. For these inspections, the SUJB appointed an independent welding expert. The inspections proved that it could not be confirmed irrefutably for four of the welds whether the prescribed working and checking procedures were fully adhered to. It furthermore cannot be ruled out that the temporary pipe hanger may have loosened during assembly, meaning that it cannot be ruled out that there was an uneven load on the reactor pressure vessel.

It was furthermore required that the additional stress on the reactor pressure vessel that may have occurred as a result of the uneven load, alongside an assessment of the effect such an additional stress would have on the reactor pressure vessel, be calculated before the end of 2001, in case the temporary pipe hanger did become loose on Loops 1 and 3 during assembly.

The inspections of the SUJB proved that in principle, structural flaws and inconsistencies in the documentation process for welding work occurred over the same period (1994-2001), violating the stipulated quality assurance mechanisms.

According to our information, the police has resumed its investigation at the behest of Greenpeace, which objected to the conclusions of the original investigation on grounds of this supposedly pertaining to a different weld."

Excerpt from minutes of Wunsiedel meeting on 18 October 2012 [13]:

Dana Drabova, director of the Czech Office for Nuclear Safety (SUJB): “I’d like to say something more positive, and more concrete: During the last talk between myself and Ms Artmann, the possibility of an international inspection was mentioned. We will be pleased to let not only the overall German, Bavarian or Franconian authorities participate. Other tests and supervisory measures may also participate. It will be up to you to decide exactly which experts, expert bodies or authorities will participate.”

Brigitte Artmann, Wunsiedel district councillor: “May I ask about this again. We are talking about the documents related to these incidents, specifically the ones named by Greenpeace?”

Dana Drabova: “It goes without saying that as part of an operational inspection of Block 1 of the Temelin NPP, it will be possible to test and check the named weld, to touch on this issue and address it.”

Brigitte Artmann: “I need to ask one more time, concretely. I am a layperson. Firstly, thank you very much for this offer. So we could get the spot in question checked, with methods like in the two Belgian NPPs? Like I said, I am a layperson.”

Dana Drabova: “I am also a layperson in this regard. I understand your question to be about whether this involves a regular or a special method. The methods in Belgium are not special, they are fixed aspects of a testing procedure that are used in a completely regular fashion. One more thing, perhaps. This ultrasound testing method is nothing new. Maybe it is for the Belgians because it was used here for the first time for testing the entire reactor vessel.”

Brigitte Artmann: “We will need Mr Majer then. But please, let me ask again. So the experts, whose names we will of course disclose to you, would also be granted access to the files. Whether at CEZ or SUJB.”

Dana Drabova: “I wish to emphasise again that I have no intention of restricting in any way, or by any means, which experts may participate, be they from the Bavarian or federal authorities or technical professionals.”

Question from… presumably the official representative from the Kulmbach district: “When could these inspections take place?”

Dana Drabova: “Well, that’s the bad news. 2014. You will appreciate that this kind of testing can’t take place just like that.”

Jan Haverkamp, Greenpeace: “So it will be when the fuel rods are next replaced?”

Dana Drabova: “That should be the case. 2014.”

District administrator Dr Karl Döhler, Wunsiedel district administration office: “Thank you very much, we have just heard an invitation for an international inspection.”

Significant results from the meeting at the Temelin nuclear power plant on 15 July 2013, in which the author of this report participated [12]:

Mr Jiři Janovec, CSC (a SUJB assessor) reported that his examination methods proved beyond doubt that no unpermitted change had been made to Welding Seam 1-4-5.

He conceded that his examination methods did not represent exhaustive proof of the examined welds' quality, as his methods only examined the surface of the welds.

The director of the Temelin nuclear power plant refused to give the German party or Greenpeace access to the welding documentation pertaining to the connecting welds on the reactor pressure vessel.

1.2 Assessment of facts

Firstly, it needs to be noted that the extracts of the documents quoted in 1.1 are full of contradictions. On the one hand, the witness who contacted Greenpeace stated that unpermitted and/or undocumented modifications were made to Welding Seam 1-4-5. On the other hand, Mr Janovec, the expert contracted by the Czech State Office for Nuclear Safety, states that his testing procedure – which he claims is in line with current scientific and technological practices – has unequivocally proven that no unpermitted modifications were made at a later stage to Welding Seam 1-4-5 or any other welds directly on the reactor pressure vessel.

Because only one of these two statements can be true, we must first consider the credibility of the Greenpeace witness and of the expert Mr Janovec.

The trustworthiness of the Greenpeace witness cannot be evaluated at this stage because the author of this report is not personally familiar with this witness. The claims made by the Greenpeace witness are plausible in content. Although the illegal proceedings of the welding company described by the witness would be very unusual, they are not impossible. Resultantly, all subsequent evaluation of the facts assumes that the unpermitted opening of the weld and subsequent rewelding, as described by the witness, is a real possibility.

The attempt by Greenpeace and the Wunsiedel district chapter of Alliance 90/The Greens to get a clear idea of what happened in relation to the facts outlined in 1.1 reveals that several of the involved parties have exhibited a large amount of inexplicable behaviour. The institution most crucial to the clarification of facts but also most contradictory in its behaviour is the Czech SJUB State Office for Nuclear Safety, specifically its director Ms Diana Drabova. The various requests for access to the documentation pertaining to the production of Welding Seam 1-4-5 were handled peculiarly and in a way that does not inspire confidence. Ms Drabova conceded that the documentation as a whole did not meet the given requirements. Regarding one file that was created in the context of the investigation of the allegations on Welding Seam 1-4-5 (File 15/2001/SUJB), Ms Drabova first declared that the file was not suitable for public access. Later, she claimed that the file was not in the possession

of the authority but of the operator, and another time, she claimed the file did not exist nor had it ever existed. [2] Another version by Ms Drabova regarding File 15/2001 states that the file was destroyed in response to a complaint from the contractor [1] no. 12. In this context, the question arises whether Ms Drabova only realized the explosive significance of the file later on and thus abruptly decided to deny its existence.

In the context of the police investigation into the weld issue raised by Greenpeace, Ms Drabova's actions are highly questionable. Although she knew that the alleged manipulation was related to Welding Seam 1-4-5, she did not correct the police's misapprehension that Welding Seam 1-1-5 was the one to investigate [1] no. 3. Despite knowing differently, she later even cited the police's findings on Welding Seam 1-1-5 as a proof of Welding Seam 1-4-5's non-defective condition [5].

Several documents pertaining to the testing of the welds on the reactor pressure vessel at the Temelin nuclear power plant make no mention of Welding Seam 1-4-5 [1] no. 11, no. 14, [4], [5] and [6]. It is rather surprising that according to documents [9] and [12], Mr Janovec claims to have completed extensive examinations of Welding Seam 1-4-5 as early as 2001, proving beyond doubt that no unpermitted modifications had been made to this weld. It is inexplicable why Ms Drabova did not mention Mr Janovec's findings at an earlier point.

Overall, Ms Drabova's statements regarding the inspections of Welding Seam 1-4-5 are very questionable.

The explanations provided by the expert Mr Janovec in [9] and [12] regarding the inspections of Welding Seam 1-4-5 and the other welds on the reactor pressure vessel are plausible inasfar as they claim that no unpermitted modifications were made to the weld at a later time. There is no conclusive evidence, however, that the examinations – particularly of Welding Seam 1-4-5 and as outlined in documents [9] and [12] – were indeed carried out, nor that the statements given by Mr Janovec on 15 July 2013 in Temelin accurately represented the truth.

Should the inspections of Welding Seam 1-4-5 have indeed been carried out as described in documents [9] and [12] and the documentation about these inspections indeed be an accurate representation of what happened, the author of this expert report would deem it plausible that there was no unpermitted modification of the weld in question. This does not, however, mean that the original weld is compliant with the given quality requirements.

The facts outlined in 1.1 show that overall, the documentation pertaining to the production of the welds between the reactor pressure vessel and the main coolant pipes contains numerous gaps and errors, as well as several contradictions. The flawless quality required of the welds can only be proved through documentation of the preparatory stages of production, of the production itself, and of the tests carried out immediately after production; this documentation needs to be compliant with the relevant science and technology guidelines. Non-destructive examinations at a later time cannot replace these mandatory procedures accompanying production. While the radiographic tests and surface examinations carried out by the State Office for Nuclear Safety and the operator of the nuclear power plant are indeed necessary for detecting possible negative developments on the welds over the years, they do not

sufficiently prove the original overall quality of the welds. At the meeting on 15 July 2013 in Temelin, the expert Mr Janovec conceded that his surface examinations could not fully prove the flawless condition of the inside of the weld.

In conclusion, it should be noted that the justified doubts about the quality of Welding Seam 1-4-5 can only be resolved if an outside expert independent of the SUJB and of the operator is given access to the documents pertaining to the weld production and to the file 15201/15/SUJB, and if this expert is also given the opportunity to conduct a detailed examination of Welding Seam 1-4-5 while the plant is inoperative.

2 What documents are required to prove the safety of this weld, and is there a possibility that specific gaps in the documentation cannot be closed?

In Germany, the current international status of science and technology for welding in the area of pressure and activity-retaining systems in nuclear power plants is contained in a collection of nuclear safety standards (KTA = Nuclear Safety Standards Commission). The outline of required documents listed below is based on the KTA guidelines.

The production of a welding seam requires precise documentation of the suitability of welding filler materials and consumables, of the actual production of the welding seam, and of the processing of the welding filler materials and consumables. The adequate safety of the weld can only be proven if such documentation is provided in the required quality. Welding Seam 1-4-5 at the Temelin nuclear power plant qualifies as a weld in the area of pressure and activity-retaining systems in nuclear power plants.

As the documentation pertaining to Welding Seam 1-4-5 and also the documentation pertaining to the other relevant welds has to date not been made available for viewing (see Chapter 1 above), any possible gaps in the documentation of the Temelin nuclear power plant cannot be discussed here.

Listing the entirety of documents required for proving sufficient weld quality would go beyond the scope of this report. Below follows an overview of the main aspects to be covered by the required documentation:

According to KTA 1408.1, "**Quality Assurance of Weld Filler Metals and Welding Consumables for Pressure- and Activity-Retaining Systems**

in Nuclear Power Plants, Part 1: Qualification Testing, Version: 2008-11" [15], the following aspects need to be documented among others:

Details on the chemical composition of the weld filler materials and welding consumables.

Details on the qualification testing of the weld filler materials and welding consumables.

Report from the supervisory authority on the qualification tests of the weld filler materials and welding consumables.

Documents describing the production of the weld filler materials and welding consumables.

Documents describing the drying conditions for coated welding rods, weld flux and flux cored electrodes.

Documents describing the verification of welding behaviour.

Documents describing the testing for hot cracking susceptibility.

According to KTA 1408.2, "**Quality Assurance of Weld Filler Metals and Welding Consumables for Pressure- and Activity-Retaining Systems**

in Nuclear Power Plants, Part 2: Manufacture, Version: 2008-11" [16], the following aspects need to be documented, among others:

Basic materials for wires, bands, flux, coatings and filler metals.

Analysis of inert gases.

Test results on test coupons for testing the weld metal.

According to KTA 1408.3, "**Quality Assurance of Weld Filler Metals and Welding Consumables for Pressure- and Activity-Retaining Systems**

in Nuclear Power Plants, Part 3: Processing, Version: 2008-11" [17], the following aspects need to be documented, among others:

Official inspection of welding procedure sheet, heat treatment plan, and materials testing and specimen removal plan.

Test results from test coupons from the weld metal.

According to KTA 3201.1, "**Components of the Reactor Coolant Pressure Boundary of Light Water Reactors, Part 1: Materials and Product Forms, Version: 6/98**" [18], the following aspects need to be observed for documentation:

Proof of the tests conducted during production needs to be documented and compiled into a quality documentation. The quality documentation needs to be created alongside the production process. As a general rule, all test results are to be confirmed by stamp and signature.

Modified and audited documents are to be documented in a way that ensures traceability back to the original planning documents.

All repairs require advance approval from the supervisory authority. The causes of the repair need to be identified, documented and communicated to the authority.

According to KTA 3201.3, "**Components of the Reactor Coolant Pressure Boundary of Light Water Reactors, Part 3: Manufacture, Version: 11/07**" [19], the documentation must take account of the following aspects:

During welding work, welding logs are to be recorded. The welding log serves to prove that the requirements of the design-approved welding procedure sheet were complied with during manufacture, and to document which welders completed which individual welding tasks. The welding log is to show all cases where the welding procedure sheet was deviated from and also record the reasons for such deviations. The log is also to record any unplanned interruptions in the welding work as well as any other irregularities.

Like the original manufacture, all repair activities are to be documented and accounted for.

In the event that the original Welding Seam 1-4-5 was indeed cut and subsequently re-welded, at least the following should have been documented, in reference to the welding progress at the time of cutting the weld [14]:

- Documentation of the weld condition at the time the incorrect positioning of the pipe section was detected.
- Formulation of a weld cutting technical plan and a technical plan for restoring the weld fusion faces by the head welding engineer; confirmation of these by the supervisory authority and subsequent operator. The technical plans specify how much of the basic material (as well as of the cladding if needed) must be removed in order to avoid working with any pre-damaged material in the subsequent welding process (heat-affected zone).
- Exact measurement of the two pipe sections, each with the new length and geometry.

- Specification of any required compensatory measures in response to the changed geometry of the leg; approval by the supervisory authority and subsequent operator. Specification of a special measurement programme (cold-state bench marks and position points, displacement during heating-up stage, vibration measurement).
- Completion of welding of basic material/cladding based on repair techniques generally accepted for these materials and matching the order of the weld layers; completion of all required intermediate examinations of the positions of the welding beads. Documentation of the results of the intermediate examinations.
- Final examination to ensure there are no cracks using high-resolution detection systems.
- Specification of additional testing measures: Structural check through macro etching, a tighter testing schedule, and prioritised repeat testing during start-up and system operation.
- Compilation of a completion report about the repair.

A large part of this required documentation can only be authoritative if it is carried out in the course of the manufacturing process. If this was neglected, the required quality of the affected welds cannot be guaranteed.

3 What would need to be publicly disclosed or done in order to reliably prove the flawlessness of the weld in question?

In order for concerns about the flawlessness of Welding Seam 1-4-5 to be alleviated, firstly all of the documentation must be disclosed. Based on this documentation, it could then be clarified whether safety-related sections of the required documentation are missing. Should this be the case, the only option would be to re-weld the seam according to the current scientific and technological practices, thereby removing the possibility of any shortcoming. It is not possible to assess the required quality by means of subsequently preformed non-destructive inspections.

Given the facts known to date, the existing documentation must be considered deficient. Independently of whether an illegal cutting of Welding Seam 1-4-5 did in fact take place, as claimed by the Greenpeace witness, there is plenty to suggest that the required quality has not been proven for any of the welds connected to the reactor pressure vessel. Based on this, it would be the duty of the Czech State Office for Nuclear Safety to remedy the situation.

The federal German Ministry of the Environment and the Bavarian Ministry of the Environment should examine the outlined issues in-depth and ensure that the safety status of the discussed welds is fully clarified. As is stated in the letter from the Ministry of the Environment [7], the Czech authorities would be willing to cooperate in this regard.

4 Has there been a case in Germany where specific gaps in documentation have forced the replacement of components in nuclear power plants?

In Germany, there have been several occasions where important components needed to be replaced or their holders and connections renewed as a result of documentation shortcomings identified through regular safety inspections. The author of this report recalls the following cases in particular:

At the Biblis nuclear power plant,

- a primary shut-off fitting needed to be replaced due to confusion in the documentation pertaining to the manufacturing process (forging or casting),
- control cable connections needed to be replaced due to insufficient documentation, and
- the fasteners of main steam lines needed to be renewed as the existing documentation could not prove that the required load transference (also described as the bench mark) could be granted.

In a number of different nuclear power plants across Germany, hundreds of fasteners (screw anchors) used in safety-critical sections of constructions needed to be replaced as a result of lacking assembly documentation.

5 References

Some of the references listed here are available on the internet, whereas others were made available to the author for the purposes of this report by institutions and persons interested in the clarification of the discussed issues. The translation of documents into German was commissioned by the Bundestag parliamentary group Alliance 90/The Greens and supplied by the German Parliament's Language Services.

Electronic copies of all of the references cited here may be requested from the author.

[1] THE RISKS OF ŠKODA

Unsettling facts on the Temelín Nuclear Power Plant concerning faulty welding work and documentation in Temelín block 1, Fact Sheet, Version 5.0, Jiří Tutter, Jan Haverkamp, 29 May 2006

[2] Chronic welding 1-4-5 Greens_Wunsiedel.pdf

[3] Polizeiliche Ermittlungen 1674-12_Text3_DE.docx [police investigations]

[4] Assessment of the quality, service life and operational safety of the welds on the DN 850 main circuit pipe of the Temelín NPP

[5] Statement by the State Office for Nuclear Safety regarding the weld issues on the DN 850 primary circuit pipe at the Temelín nuclear power plant

[6] Conclusive information regarding the weld issues on the DN 850 primary circuit pipe at the Temelín nuclear power plant

[7] Letter to Bundestag Member Sylvia Kotting-Uhl from the Federal Minister for the Environment, Nature Conservation and Nuclear Safety (BMU), 28 November 2012

[8] E-mail to Ms Artmann from the Bavarian Ministry for the Environment, 30 November 2012

[9] Summary report on the assessment of the connecting welds on the main circuit pipe of the primary circuit of the reactor pressure vessel of the Temelín nuclear power plant

[10] *XXVII. Tage der Schweißtechnik 2005 BETRIEBSDIAGNOSTIK DER SCHWEISSNÄHTE ZWISCHEN DEM DRUCKGEFÄSS UND DER HAUPTROHRLEITUNG DES KERNKRAFTWERKES [XXVII Welding Days 2005 OPERATIONAL DIAGNOSTICS OF THE WELDING SEAMS BETWEEN THE REACTOR VESSEL AND THE NUCLEAR POWER PLANT'S MAIN CIRCUIT PIPE] Engineering Lecturer Jiří Janovec, CSc., Certified Engineer Josef Čmakal*, Daniela Poláchová, Institute for Material Engineering of the Faculty for Civil Engineering, Czech Technical University Prague, *Institute for Nuclear Fuels, Zbraslav, Prague*

[11] SUJB responses to "Respekt" magazine, 26 April 2002

[12] Minutes from meeting: Presentation of the inspection methods pertaining to the connecting welds on the primary circuit of the Temelín nuclear power plant, 15 July 2013

[13] Minutes from meeting (excerpt): Wunsiedel, 18 October 2012

[14] E-mail to Brigitte Artmann from Norbert Meyer, 3 July 2013 11:39 am

[15] KTA 1408.1 Qualitätssicherung von Schweißzusätzen und -hilfsstoffen für druck- und aktivitätsführende Komponenten in Kernkraftwerken Teil 1: Eignungsprüfung Fassung 2008-11 [Quality Assurance of Weld Filler Metals and Welding Consumables for Pressure- and Activity-Retaining Systems in Nuclear Power Plants, Part 1: Qualification Testing, Version: 2008-11]

[16] KTA 1408.2 Qualitätssicherung von Schweißzusätzen und -hilfsstoffen für druck- und aktivitätsführende Komponenten in Kernkraftwerken Teil 2: Herstellung Fassung 2008-11 [Quality Assurance of Weld Filler Metals and Welding Consumables for Pressure- and Activity-Retaining Systems in Nuclear Power Plants, Part 2: Manufacture, Version: 2008-11]

[17] KTA 1408.3 Qualitätssicherung von Schweißzusätzen und -hilfsstoffen für druck- und aktivitätsführende Komponenten in Kernkraftwerken Teil 3: Verarbeitung Fassung 11/08 [Quality Assurance of Weld Filler Metals and Welding Consumables for Pressure- and Activity-Retaining Systems in Nuclear Power Plants, Part 3: Processing, Version: 2008-11]

[18] KTA 3201.1 Komponenten des Primärkreises von Leichtwasserreaktoren Teil 1: Werkstoffe und Erzeugnisformen Fassung 6/98 [Components of the Reactor Coolant Pressure Boundary of Light Water Reactors, Part 1: Materials and Product Forms, Version: 6/98]

[19] KTA 3201.3 Komponenten des Primärkreises von Leichtwasserreaktoren Teil 3: Herstellung Fassung 11/07 [Components of the Reactor Coolant Pressure Boundary of Light Water Reactors, Part 3: Manufacture, Version: 11/07]