

# **W**orking Group on Public Communication of Nuclear Regulatory Organisations

A Public Communication  
Case Study: Switzerland



**NUCLEAR ENERGY AGENCY  
COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES**

**Working Group on Public Communication of Nuclear Regulatory Organisations**

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The mission of the NEA is:

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- to provide authoritative assessments and to forge common understandings on key issues as input to government decisions on nuclear energy policy and to broader OECD analyses in areas such as energy and the sustainable development of low-carbon economies.

Specific areas of competence of the NEA include the safety and regulation of nuclear activities, radioactive waste management and decommissioning, radiological protection, nuclear science, economic and technical analyses of the nuclear fuel cycle, nuclear law and liability, and public information. The NEA Data Bank provides nuclear data and computer program services for participating countries.

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The committee promotes transparency of nuclear safety work and open public communication. In accordance with the NEA Strategic Plan, the committee oversees work to promote the development of effective and efficient regulation.

The committee focuses on safety issues and corresponding regulatory aspects for existing and new power reactors and other nuclear installations, and the regulatory implications of new designs and new technologies of power reactors and other types of nuclear installations consistent with the interests of the members. Furthermore, it examines any other matters referred to it by the NEA Steering Committee for Nuclear Energy. The work of the committee is collaborative with and supportive of, as appropriate, that of other international organisations for co-operation among regulators and consider, upon request, issues raised by these organisations. The Committee organises its own activities. It may sponsor specialist meetings, senior-level task groups and working groups to further its objectives.

In implementing its programme, the committee establishes co-operative mechanisms with the Committee on the Safety of Nuclear Installations (CSNI) in order to work with that committee on matters of common interest, avoiding unnecessary duplications. The committee also co-operates with the Committee on Radiological Protection and Public Health (CRPPH), the Radioactive Waste Management Committee (RWMC), and other NEA committees and activities on matters of common interest.

## Foreword

The Nuclear Energy Agency (NEA) Working Group on Public Communication of Nuclear Regulatory Organisations (WGPC) has dealt with a broad range of communications issues and produced a variety of reports, including most recently, “A Comprehensive Report on Three Regional Stakeholder Workshops in Europe, North America and Asia” (NEA/CNRA/R(2017)7, February 2018). Reflecting on the outcomes of these regional workshops and taking into account cultural differences and other factors within regions, the WGPC members considered that it would be useful to provide a more in-depth analysis on case studies focusing on a specific event at the national level. With this objective, the WGPC members are engaging in a series of case studies to be held every two years during their annual plenary meetings, starting in 2018.

This first case study addressed in this report provides insights on a situation experienced by the Swiss Federal Nuclear Safety Inspectorate (ENSI) which seemed marginal at first glance in terms of public communication. However, it appeared later that the event had gathered attention and some criticism from the stakeholders concerned, including media and the civil society.

This report illustrates a practical example of how nuclear regulatory bodies can cope with these similar circumstances in an effort to better address such communication challenges vis-à-vis the general public (to put aside the associated technical aspects), with the purpose of sharing lessons learnt and relevant experiences with the wider audience and stakeholder communities.

## Acknowledgements

This first case study of the Nuclear Energy Agency Working Group on Public Communication of Nuclear Regulatory Organisations (WGPC) was made possible by the Swiss Federal Nuclear Safety Inspectorate (ENSI), who hosted the workshop in Bern, Switzerland in May 2018.

The WGPC thanks ENSI and its team for their efforts in organising the workshop and authoring this report. In particular, the WGPC members greatly appreciated hearing from the different stakeholders involved, which enhanced the learning experience from this case study.

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## List of abbreviations and acronyms

CNRA	Committee on Nuclear Regulatory Activities (NEA)
CPR	Critical power ratio
CRPPH	Committee on Radiological Protection and Public Health (NEA)
CSNI	Committee on the Safety of Nuclear Installations (NEA)
INES	International Nuclear and Radiological Event Scale
NEA	Nuclear Energy Agency
NGO	Non-governmental organisation
NPP	Nuclear power plant
PSI	Paul Scherrer Institute (Switzerland)
PWR	Pressurised water reactor
RWMC	Radioactive Waste Management Committee (NEA)
SLC	Sten Lundberg Consulting
SRF	Schweizer Radio und Fernsehen (Switzerland)
WGPC	Working Group on Public Communication of Nuclear Regulatory Organisations (NEA)

## Executive Summary

Following three international workshops held by the Nuclear Energy Agency (NEA) Working Group on Public Communication of Nuclear Regulatory Organisations (WGPC) with stakeholders in Europe, North America and Asia between 2014 and 2016, WGPC members confirmed in 2017 their initial views that differences on public communication practices exist within each region. Members concluded that, as a result of cultural differences and other factors, best practices can only be gained to a limited extent from transnational workshops. Therefore, the WGPC members planned to further their learning by focusing on case studies from individual countries going forward.

### Case study objectives

Case studies should address the following challenges and goals as set out in the “CNRA Operating Plan and Guidelines” (NEA/CNRA/R(2017)5/REV1) to improve transparency and public awareness of and engagement in regulatory activities, and to enhance knowledge transfer and management.

There are communicative challenges from which the case study host country and other WGPC countries can learn. To this end, the WGPC will examine in depth the communication work of a regulatory authority with its stakeholders on specific events. Furthermore, depending on the topic of the case study, the following goals could be addressed:

- To review and share information on the communication of inspection results to stakeholders.
- To better achieve public engagement on the unique features of an innovative design.
- To develop a better understanding of effective relationships between the regulator and operator.

The technical aspects of a given event are not within the scope of this activity. The expected output is a catalogue of country-specific public communication case studies, to be made publicly available. The value of demonstrating best practices in real situations while networking with peers has been recognised by working group members. Better understanding of nuclear regulatory organisations (NROs) and their countries’ cultures and establishing a strong network among members ensures more effective and efficient worldwide communication during an event.

### Workshop process

The country-specific case studies are discussed in the form of mini workshops. These will take place every two years as part of the annual WGPC meeting. The workshop in Switzerland is the first in this series.

The Swiss workshop took place on 2 May 2018 at the Käfigturm in Bern, Switzerland. It was organised by Sebastian Hueber (ENSI, Switzerland) and moderated by Eliot Brenner (United States). In addition to WGPC members, stakeholder representatives also took part in the workshop. These included Karin Giacomuzzi, Head of Communications at the Leibstadt Nuclear Power Plant, Valentin Schmidt, media spokesman at the Swiss Energy Foundation – a non-governmental organisation critical of nuclear energy – Thomas Färber, editor of the local newspaper “Die Botschaft” and Waltraud Zimmermann, Head of the Office for Environmental Protection of the Waldshut District Office. Also invited were a journalist from Swiss television, who had produced a critical report on the topic that had a decisive influence on communications, and a representative from Greenpeace, who had worked on communicating the incident in Leibstadt from the outset. Both of them either could not or did not want to participate.

The following individuals attended from the WGPC: Eva Gratzner-Heilingsetzer (Austria), Rhonda Walker-Sistie (Canada), Risto Isaksson (Finland), Emmanuel Buchot (France), Gábor Körmendi (Hungary), Kazushige Aoki (Japan), Yoshiko Aoyama (Japan), Hideki Haga (Japan), Jeongdae Kim (Korea), Jozef Strojny (Poland), Angel Laso d'Lom (Spain), Adriana Scialdone García (Spain), Andreas von Schmalensee (Sweden), Holly Harrington (United States), Sinead Harvey (IAEA), Pascale Bourassa (NEA), Yeonhee Hah (NEA) and Tomoyuki Saito (NEA).

The members examined communications from the Swiss Federal Nuclear Safety Inspectorate (ENSI) in connection with the local dryout at the Leibstadt Nuclear Power Plant. Technically, the topic began as a marginal topic in 2012, but then became significant from August 2016 onwards. From a safety point of view, there was never a danger at any time to people or to the environment.

In terms of communication, the public only became aware of the topic in the second half of 2016. While the Leibstadt Nuclear Power Plant repeatedly informed the public about new aspects of the incident in the second half of the year, ENSI first published information on the incident shortly before Christmas and then again, when the Leibstadt Nuclear Power Plant was approved for restart.

At first, only NGOs critical of nuclear energy reacted with occasional media releases. From January 2017 onwards, however, the media also became interested. The broadcast of a television report on 1 February 2017, which was very critical – and also flawed – triggered a wave of public reaction. ENSI and the operator of the Leibstadt Nuclear Power Plant then came under pressure.

## Workshop conclusions

Looking back, there are aspects of communication that went well and some aspects that could otherwise have been better. The main areas in this context revolve around which terminology should be used to explain complex technical aspects, how best to have dealt with media coverage, and what impact the timing of communication measures can have on the public.

## 1. Case study: Background and events

To provide context and to assist in better understanding the specificities of the case study, the following technical information regarding the Leibstadt Nuclear Power Plant (NPP), the sequence of events that make up the case study and Swiss communication requirements and approach were provided to the participants, with an overview presented at the beginning of the workshop.

### *Technical characteristics of the Leibstadt NPP (KKL)*

#### **General**

Type: GE BWR/6  
Mark III containment  
Commercial operation: 1984

#### **Reactor core**

3 600 Megawatt thermal power  
1-year cycles  
648 fuel assemblies (96/91 fuel rods each)  
149 control rods  
Mixed core (Westinghouse & AREVA)  
High power density (compared to the fleet)  
High burnup limit: 75 MWd/kgU (local)

#### **Location**

The location of the NPP is shown in Figure 1.

**Figure 1. Location of the Leibstadt NPP in Switzerland**

Source: openstreetmap.org.

### ***Sequence of events***

As a consequence of damage to a fuel rod from cycle 30 in 2014, KKL extended the inspection programme for fuel elements in the main annual overhaul of 2016 to check the effectiveness of countermeasures implemented in cycle 32 (2015-2016). These measures included flat power distribution and increased mass flow.

Analyses by the fuel element manufacturer revealed that the fuel rod damage resulted from a local cooling deficiency in normal operation, a so-called dryout. Additionally, subsequent inspections of fuel elements after cycle 31 showed that the fault was apparently a systemic fault (several indications, but no leaker).

The dimensions of the dryout indications in cycle 31 (2014-2015) were much smaller and they occurred in smaller numbers. The typical "V"-like oxidation marks on the surfaces of the fuel rod cladding were, without exception, on the two rods that are directly adjacent to the partial-length corner rod. Findings were only identified below the last-but-one (no. 7) and last (no. 8) spacers. The individual findings have an overall length up to ca. 200 mm.

In the inspections during the 2016 main annual overhaul, KKL identified that the new inspection results disproved the suitability of the measures taken, and it therefore expanded the inspection programme. Four expansions in total were undertaken until the KKL and the fuel element manufacturer were convinced that they had created an adequate database for the characterisation of the occurrence and evaluation of the dryout findings. By the end of the inspection programme, more than 200 fuel elements in total had been subjected to a visual inspection. Consequently, the restart was delayed by six months.

Additional inspections had shown among other things that slight discolouration of individual fuel rods at the adjoining corner rods also occurred in previous cycles (from cycle 29). The majority of fuel elements investigated and evaluated with findings up until now are those fuel elements that were in a so-called orifice position 3. However, indications of dryout could also be identified on elements that were in orifice position 2. There were no dryout findings on fuel elements that were in orifice position 1.

For cycle 33 (2017), 15 fuel elements were repaired by replacing severely affected rods with dummy rods. Moreover, as a result of the inspection programme in 2016, the core flow – that is, the quantity of water pumped through the core per unit of time – was limited to a maximum of 95%. Additionally, the power per fuel element for fresh fuel elements in the first cycle was limited to 7.0 megawatts for continuous operation or 7.2 for short-term operation. This corresponded to a reduction in power of around 20% for the fresh fuel elements. The result of these measures was that the thermal power of the Leibstadt reactor had a maximum value of 94% at the start of the operating cycle that fell to around 88% by the cycle end.

The inspections conducted during the 2017 main annual overhaul revealed no findings, indicating that the measures were successful. Accordingly, the measures were also adhered to for cycle 34 (2017-2018).

### ***Requirements for informing the public***

Article 74 of the Nuclear Energy Act<sup>1</sup> obliges ENSI to “regularly inform the public about the condition of nuclear installations and about matters concerning nuclear goods and radioactive waste” as well as of “special occurrences”.

Article 76 of the Nuclear Energy Ordinance<sup>2</sup> specifies the “special occurrences and findings in nuclear installations”. They have to:

- represent a hazard to the installation or its personnel, or have significant radiological impacts on the environment;
- be of significance in terms of safety, but have no or only a negligible radiological impact on the environment;
- be of public interest.

ENSI provides ongoing information on its website on the more relevant reportable occurrences in nuclear power plants, namely:<sup>3</sup>

- if an occurrence is assigned to either International Nuclear and Radiological Event Scale (INES) Level 1 or greater;
- when security systems have been triggered;

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1. *Nuclear Energy Act* (2003) (status as of 1 January 2020), Section 6: “Supervision”, Art. 74: “Provision of information to the general public”, The Federal Assembly of the Swiss Confederation, available at:

[www.admin.ch/opc/en/classified-compilation/20010233/index.html#a74](http://www.admin.ch/opc/en/classified-compilation/20010233/index.html#a74) (accessed in May 2018).

2. Nuclear Energy Ordinance, 2004 (status as of 1 February 2019), Chapter 6: “Procedures, Information and Promotion”, Art. 76: “Obligation to provide information about special events and findings relating to nuclear safety”, The Federal Council, available at:

[www.admin.ch/opc/en/classified-compilation/20042217/index.html#a76](http://www.admin.ch/opc/en/classified-compilation/20042217/index.html#a76) (accessed in May 2018).

3. Swiss Federal Nuclear Safety Inspectorate ENSI (2020), “Events”, [www.ensi.ch/en/topic/events/](http://www.ensi.ch/en/topic/events/) (accessed in May 2018).



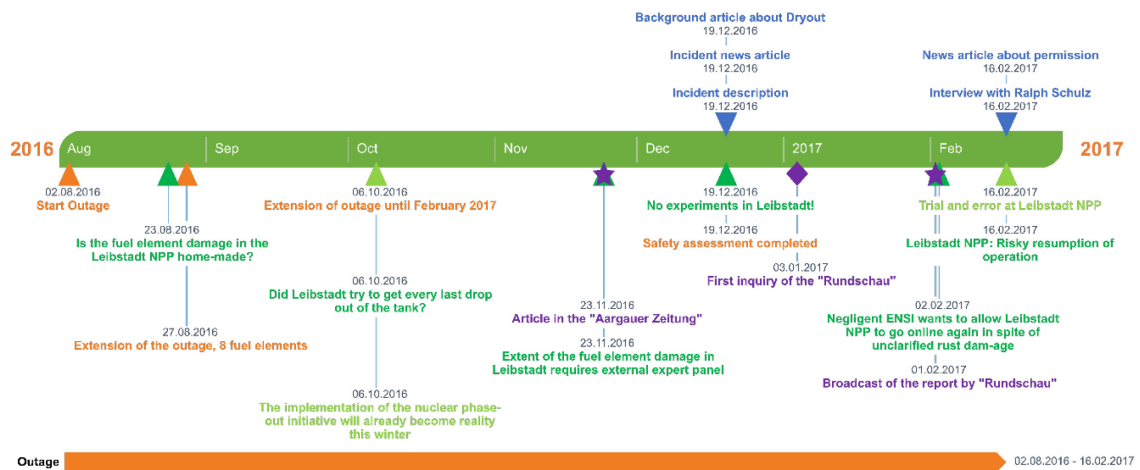
- if the incident is more than 1 in 100 million likely to result in core damage;
- if there has been an incorporation of radioactive substances with a subsequent dose of more than 1 mSv.

ENSI's information to the public is given mainly in German and French. Individual texts are also published in Italian and English.

### Informing the public

ENSI publishes an “oversight report” once a year. In it, ENSI provides details on the condition and operation of nuclear power plants in the previous year. Thus, for instance, ENSI reported on the findings on the fuel elements in the Leibstadt NPP in its 2014<sup>4</sup> and 2015<sup>5</sup> oversight reports.

**Figure2. Publications by ENSI, KKL, Greenpeace and the Swiss Energy Foundation, as well as relevant media events**



Source: OECD/NEA, 2018.

For a main annual overhaul, it is the operator who is primarily responsible for providing information. ENSI only provides information in case of special events when ENSI assumes a role and in approving restart after the completed overhaul. This information is provided by means of articles on the ENSI website.

The operator has also reported regularly on the main annual overhaul of the Leibstadt Nuclear Power Plant (KKL). The KKL promptly informed<sup>6</sup> the public about the incident

4. Swiss Federal Nuclear Safety Inspectorate ENSI (2015), *2014 ENSI Oversight Report* – ENSI-AN-9252, 24 June 2015, [www.ensi.ch/en/documents/2014-ensi-oversight-report-ensi-an-9252/](http://www.ensi.ch/en/documents/2014-ensi-oversight-report-ensi-an-9252/) (accessed in May 2018).

5. Swiss Federal Nuclear Safety Inspectorate ENSI (2016), *2015 ENSI Oversight Report* – ENSI-AN-9671, 28 June 2016, [www.ensi.ch/en/documents/2015-ensi-oversight-report-ensi-an-9671/](http://www.ensi.ch/en/documents/2015-ensi-oversight-report-ensi-an-9671/) (accessed in May 2018).

6. See press releases in the Annex.

(the findings on the fuel rods) during the 2016 annual overhaul and about further developments, including postponement of the restart.

For its part, ENSI promptly informed the public by the end of 2016, after the incident had been processed. Up until this point, the supervisory authority was not in a position to communicate details of decisions or actions that would have supplemented the information from the operator. In addition to a news article, the information package includes a standardised technical incident description and a background article on the topic of dryout, including graphics.<sup>7</sup> Media response was somewhat limited.

At the beginning of 2017, a journalist from the “Rundschau”<sup>8</sup> began research on the subject. Journalist Res Gehriger contacted ENSI five times in total and asked, among other things, for an interview. ENSI did not give an interview or go beyond what had already been communicated about the incident. It did, however, provide technical information. The journalist also conducted research at the KKL.

On 1 February 2017, “Rundschau” informed other media in the afternoon that it would be broadcasting a piece on the subject of dryout in Leibstadt in the evening. In addition, other news programmes on Swiss television and their websites provided information on the subject.

The more than 13-minute report<sup>9</sup> was very critical and dramatic, and contained a number of errors. Above all, an illustration suggested that at times the fuel elements were not even covered by water. It was also imputed that the incident had been kept secret for a long time.

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7. See the article in the Annex.s

8. “Rundschau” is a magazine-type programme broadcast on Swiss public television and is investigative in character ([www.srf.ch/sendungen/rundschau/rundschau-4](http://www.srf.ch/sendungen/rundschau/rundschau-4)). It is broadcast every Wednesday at 9:00 p.m.

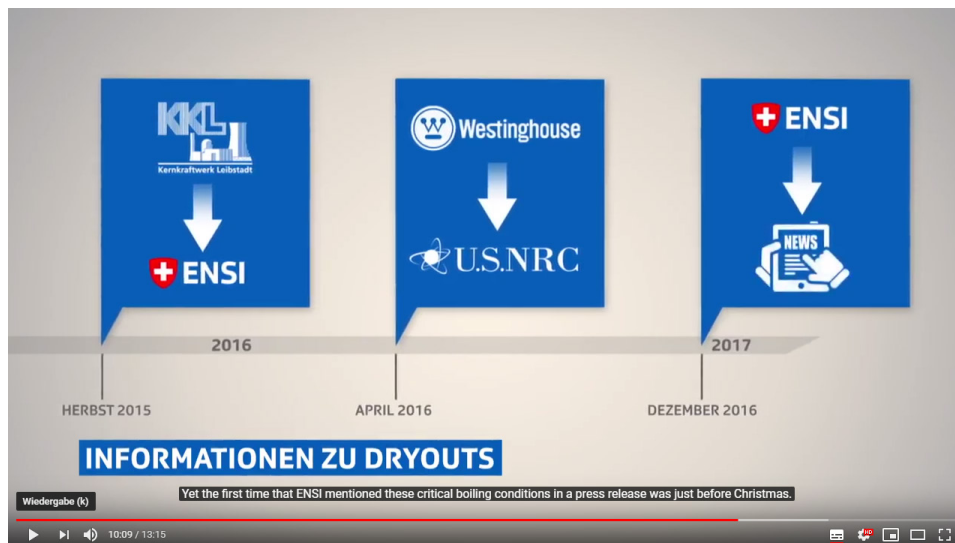


Figure 3. Graphic from the “Rundschau” report



Source: ENSI IFSN YouTube Channel, Rundschau, “Local Dryouts in Leibstadt NPP”, [www.youtube.com/watch?v=6Um3wG8Arks](http://www.youtube.com/watch?v=6Um3wG8Arks), accessed in May 2018.

Figure 4. Graphic from the “Rundschau” report



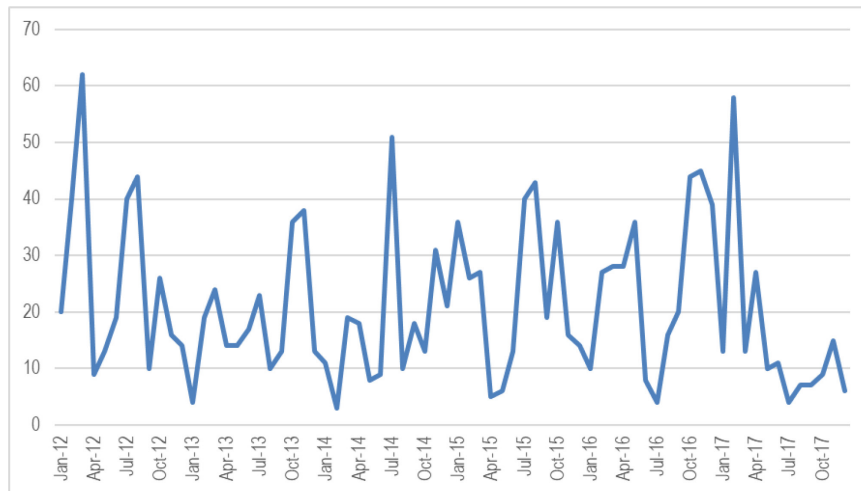
Source: ENSI IFSN YouTube Channel, Rundschau, “Local Dryouts in Leibstadt NPP”, [www.youtube.com/watch?v=6Um3wG8Arks](http://www.youtube.com/watch?v=6Um3wG8Arks), accessed in April 2018.

On 16 February 2017, ENSI granted the Leibstadt Nuclear Power Plant permission to restart, subject to certain conditions, in the late afternoon. ENSI informed the public about this in an article<sup>10</sup> on its website. In a written interview on the ENSI website with Ralph Schulz, Head of the Safety Analyses Division and a member of ENSI's Executive Board, ENSI also responded to sensitive questions that had accumulated since 1 February 2017.

10. See Annex.

As a result of the “Rundschau” report and later reports in other media, many enquiries came in from the media and the public. In February 2017, ENSI received 102 enquires from the public – more than had been received since the statistical survey in 2012. The monthly average is around 18 enquiries. The vast majority of them expressed criticism or concern.

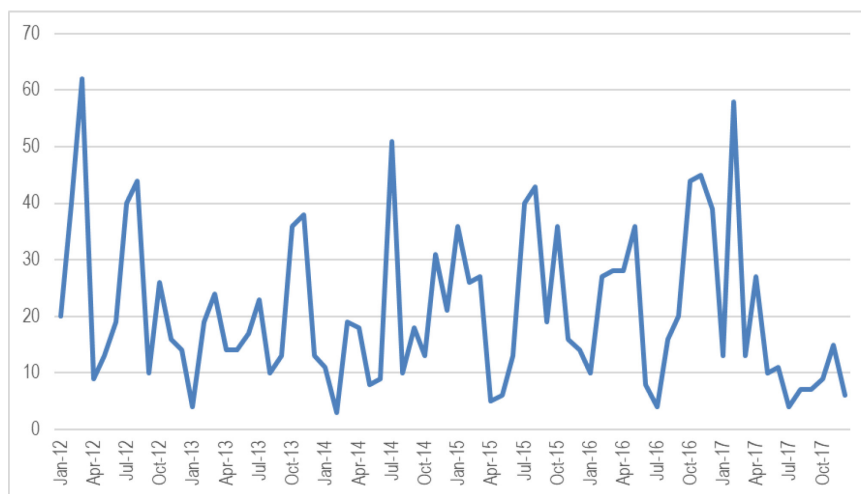
**Figure.5. Number of enquiries from the public 2012-2017**



Source: NEA, 2018.

There was also a record number of media enquiries. With 58 enquiries, almost one-third of the annual volume was reached in February alone. A peak was reached in calendar week 7 when 29 enquiries came in. This was the week in which ENSI gave the Leibstadt Nuclear Power Plant the go-ahead to restart.

**Figure 6. Number of media enquiries 2012-2017**



Source: NEA, 2018.

The spring session of the Swiss Parliament began two weeks after restart was approved. In this session, six questions were posed during question time<sup>11</sup> and an interpellation<sup>12</sup> was submitted by parliamentarians throughout the session.

Subsequently, ENSI took up the topic in detail in the Technical Forum for Nuclear Power Plants (TFK).<sup>13</sup> In addition, on 13 December 2017 ENSI Director Hans Wanner and power plant manager Andreas Pfeifer faced questions put forward in the district assembly of the German city of Waldshut. The nuclear power plant also held various information events for the local population in the second quarter.

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11. The Monday sittings of the National Council in the second and third weeks of each session open with a question time. The Council deals with topical questions that members of the Council submitted before midday on the Wednesday of the previous week. A brief answer to these questions is given by the head of the department responsible for the matter at hand. The member asking the question may subsequently ask a brief supplementary question related to the same matter. Question time lasts no longer than 90 minutes. Question time is held only in the National Council.

12. An interpellation is a procedure used by Council members, a majority of the members of a committee, or a parliamentary group to request information from the Federal Council on important domestic or foreign events or on federal matters. The Federal Council normally responds before the next session. The author of an interpellation may express their level of satisfaction with the answer, and can also demand a debate on the answer. In practice, a debate of this type is only held in the Council of States; the National Council only debates interpellations that have been declared urgent.

Interpellations can be declared urgent by the offices of the Councils, which means that the Council concerned must deal with them in the current session. In the National Council, if at least 75 members request a debate on current issues in relation to specific urgent interpellations, this debate must be held.

13. The Swiss Federal Nuclear Safety Inspectorate ENSI has a platform – the Technical Forum for Nuclear Power Plants (TFK) – where questions from the general public about the safety of Swiss nuclear power plants can be discussed. In a standing committee, representatives of the communes, cantons, non-governmental organisations, nuclear power plant operators and other authorities involved can comment on safety issues.

## 2. Workshop input

In addition to the members of the WGPC, stakeholder representatives also took part in the workshop discussions. Below is a summary of their presentations.

### ***Leibstadt Nuclear Power Plant (KKL)***

Karin Giacomuzzi, Head of Communications at Leibstadt Nuclear Power Plant, gave a presentation dealing with the communication elements concerning the event at the Leibstadt NPP. In her presentation, she explained the licensee's organisational profile, its general public and corporate communication and stakeholder engagement activities and efforts. She explained the actual communication developments in the aftermath of the event in 2016, by dividing the timeline into four stages, and addressing how information regarding the event was covered and delivered by the licensee and media at the initial and subsequent stages. She noted how the Leibstadt NPP monitored the news delivery by media and when it stopped its active communication activities covering the event. She expressed her views on the challenges faced by Kernkraftwerk Leibstadt AG (KKL) in terms of communication throughout the event process and what triggered a high-level of public and media attention. Noting the increase in reputational damage following the event, she shared the associated actions taken by the licensee, how the media coverage shifted at the later stages, and the follow-up activities as part of the licensee's public information and stakeholder engagements.

### ***Swiss Federal Nuclear Safety Inspectorate (ENSI)***

Sebastian Hueber described the actions taken by the nuclear regulator, and included the story behind the scene. He first reviewed the legal requirements and criteria of ENSI for public information associated with a nuclear event. He depicted the development of the event and the relevant communication and stakeholder engagement activities conducted by ENSI through a timeline, and described how he dealt with media coverage. He showed a broadcast news coverage featuring this event so that WGPC members could better grasp and understand how the event was portrayed through a more concrete and vivid image. He added that there was a sharp increase of public inquiries and media interest during the course of the event.

### ***Swiss Energy Foundation (SES)***

Valentin Schmidt, media spokesperson of the Swiss Energy Foundation, illustrated how the foundation dealt with and reacted to the Leibstadt dryout in terms of communication. He also touched upon the historical and political contexts and background in Switzerland and provided a broader national energy perspective. He introduced as an example the foundation's activities in the form of press releases, and summarised the points made therein. He also mentioned how his foundation communicated with different stakeholders who showed different levels of interest in the event. As a conclusion, he emphasised that NGOs want to understand the decisions to be made, expect transparency, which leads to

confidence-building vis-à-vis the public. In this regard, he noted the appreciation for a technical forum where questions can be answered.

### ***Die Botschaft Newspaper***

Tomas Färber, editor of the newspaper “Die Botschaft”, shared his experience and impressions of how the event was reported and how he reached out to different groups of stakeholders. He took note of the difficulty of translating technical, new, fragmented and ongoing information to plain language so as to appropriately inform the readers. He then referred to the difference between national and local newspapers and other media channels in addressing the event and the possible consequences at both the national and local levels. He pointed out the excessiveness of relevant information dispatched by the regulatory body, licensees and other entities, making it at times difficult to discern if the story is highly significant. He also noted that public meetings need to be announced broadly to ensure interested parties can participate.

### ***Waldshut District Office***

Waltraud Zimmermann, Head of the Office for Environmental Protection of the Waldshut District Office, Germany, introduced her office and its geographical proximity to the Leibstadt site. She described the development of the event in her region in chronological order, and indicated how scepticism remains deeply-rooted in Germany in the area of nuclear energy and development. She noted her appreciation for the Leibstadt operator for keeping her office well informed throughout the event. She also appreciated the ongoing information sharing from ENSI, noting the importance of knowing the nuclear authority before a crisis takes place.

### 3. Workshop discussions

These series of presentations were followed by discussion, questions and answers, and comments by the group, including:

- How did KKL and ENSI fill in the so-called “media vacuum” in such crisis communication situations following the occurrence of the event.
- When and to what extent technical terminologies (e.g. dryout) should or should not be converted in light of possible impacts on the perception of the public.
- Whether the INES scale was effective enough as a public communication tool during the course of this event.
- Whether ENSI monitored coverage or information flows by social media during the event.
- To what extent the event damaged the confidence and reputation of KKL or ENSI in relation to the general public, and if so, what were the consequences.

In addition, use of technical terms was discussed along with the associated dilemma between being accurate while making information clearly understandable. A view was expressed that such terminology needs to be sufficiently understandable as well as accurate. The fact that, over time, terms used in communications have changed was also addressed. While the KKL was still speaking of “discolouration”, ENSI spoke of “oxidation”. There was also talk about the use of visuals, such as graphics or even animated graphics. The NGO representative explained that they do not “stick” to concepts, but use topics when they can be useful for their own concerns.

Another point was the time factor: When is it the time for talking and when is it time to be silent? If you do not fill an information vacuum yourself, the media will do so. This also includes the question of whether, after the “Rundschau” report was broadcast, there should not have been some reaction in order to correct the errors.

A proposal was made to consider the option of inviting media and the public to the site or other appropriate venues during the initial and progressive stages of the event. Another point was made that communication efforts should be embedded in the overall framework of a strategy.

A comment was made as well to note the challenge and need of promoting trust building through transparency and adequate information sharing with lay people over the long term. The need to review the event in Leibstadt to find out if there was anything misunderstood by the public and of reacting more quickly was also pointed out.

## 4. Lessons learnt from workshop participants

Questionnaires<sup>14</sup> were distributed to collect lessons learnt. The following questions were addressed.

*What would I have done in the same way? Why?*

Several stated that they would have collected information from the technicians in the same way. The press release was also mentioned as a good tool. Like ENSI, most would not have given an interview. Spain writes: “The communication department would have had a discussion about giving an interview to a journalist because we rarely give interviews when it comes to a sensitive issue like this that normally generates a lot of controversy in the public opinion. We are concerned that, since it is a sensitive issue, they could use the interview for their own interests. We wouldn’t like the interview to turn into a misunderstanding of the communication and so we prefer to release information through a press release on our website and to give the journalist that information.” Austria mentioned that: “Making Interviews is always sensitive because it can be misused easily [and]this has to be considered very carefully.”

There was recognition of the Technical Forum for Nuclear Power Plants. On this point, Austria writes: “The idea of establishing the forum is very good and effective, as it guarantees a ‘standing’ dialogue (co-operation and also trust) between the stakeholders (including media/journalists). It helps to exchange information, prevent rumours and learn facts from ‘first hand’. The approach that ‘critical people’ play an important role in the society is a very good basis for good relations with stakeholders and the general/interested public. It is important to communicate that even if the attitudes/views are different, the aim of improving nuclear safety is common and shared by all parties.”

In Japan, it would primarily be the responsibility of the operator to inform the public: “When such a trouble or incident happens at a nuclear facility, the operator will have press conferences, issue press releases, and try to explain to the public and media. For each individual trouble/incident, we will not issue the press release but the technical report with the information of the corrective action as necessary. Of course, we will explain the further regulatory action to the media. All relevant material will be posted on our website. We will have press conferences and issue the press releases at the time of the occurrence of a severe event (or during an emergency) like the JCO (formerly Japan Nuclear Fuel Conversion Co.) criticality accident in 1999 (INES Level 4) and the Fukushima Daiichi nuclear accident.”

It was also noted that the operator's wording “discolouration” would not have been adopted.

*What would I have done differently? How and why?*

Several participants would have made greater use of social media, in particular to correct the erroneous information in the “Rundschau” report. Generally, it was stated that a vacuum should not have been allowed to form.

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14. Ten completed questionnaires were submitted.

Some would have worded things differently. The United States would have done without the term “dryout” as this was misleading. France would have also done without this term, using instead a term such as: “default of the cooling system”. Poland would have also done without terms such as “critical boiling condition” or would have explained them clearly.

There were also different views on the interview. Finland writes: “Radiation and Nuclear Safety Authority (STUK) never refuses (at least this has never happened) to give an interview to media. The person who would have discussed with the journalist would have been an expert of the issue, not a spokesperson or a manager (if he/she is not an expert). Before the expert had given the interview, we would have thought about the basic message STUK wants to transmit – no harm to employees in the NPP, no harm to people living nearby, no harm to the environment. We know that if STUK is not giving an interview, someone else is.”

As far as timing was concerned, Spain notes: “We have different legal obligations in Spain as a regulator and we do have to inform [the public] about anything that happens in a nuclear power plant through our website even if it is not a radiological hazard event. At the same time, as a regulator we are in charge of informing, together with the operator of the nuclear power plant, but we do not have to wait until they release their information to post our information. We have the procedures where it says that we have to inform as soon as we get the incident information, sometimes in 24 hours and if it is more important in 1 hour.”

*What are my primary lessons learnt?*

Three lessons were learnt in particular:

1. Even incidents that are not so important from the point of view of safety must be communicated well. In this respect, Japan writes: “This case study shows that the minor event sometimes draws the strong attention and interests from the public and media, regardless of the INES level and the safety significance of the event. I think that we should not underestimate the minor event in terms of the public communication.” Finland adds: “Decisions about communication need to be made from the point of view of people and the media. What can cause worry or fear must be told.”
2. The language must be clear and comprehensible. Technical jargon can be misunderstood. Graphics should also be used for explanatory purposes.
3. An information vacuum must be avoided as this can lead to rumours. If you have any information, you should disclose it and not just keep waiting, unless there are good reasons to do so. France recommends not to wait to have a complete understanding of a technical issue before communicating. It is better to give partial information on a regular basis rather than give complete information but too late. Some recommend doing this with background information. Erroneous reports need to be corrected immediately. The United States recommends: “Use your social media to communicate directly to the public – before and after negative coverage. France supports the recommendation that social media is a good tool to do fact-checking.”

Participants also underlined the importance of building trust on a daily basis. In this respect, Austria makes particular mention of the media: “It is important to build trust in peace times with the media (journalists who are usually reporting on these kinds of information/issues). If possible it is helpful to establish a personal contact (telephone call, meetings), so that you can rely on these relations built before times of crisis/events/problems. The personal



contact most probably is an inhibition for journalists/other spokespersons etc. to disseminate false information.” Spain mentions the wider public: “Build confidence every day so that when something like this happens we have already the trust of the public opinion. Build trust every day.”

Canada recommends: “Consider finding another/more third party experts to provide information regarding safety.”

### ***Final considerations***

Poland also notes that media attention can be positive: “Media crises are always a good opportunity to increase the visibility of the regulatory [body]. It gives you the necessary media attention which might be useful for instance to implement some educational background in published press releases.”

The Working Group on Public Communication of Nuclear Regulatory Organisations (WGPC) members recognised that communications should be transparent, accurate and remain factual and that any speculation should be avoided. This builds trust and credibility. It is also recognised that, in the absence of information, a void is created which may get filled by something else. Hence, the right balance must be sought, which may include delivering partial information early during an event, when that is all this is available.

The United States also recommended that communication staff interact regularly with technical staff and obtain information from them during normal operation. This practice gets technical staff accustomed to providing information to a more general public and sensitises them to the public communication process and approaches used by the organisation. Sweden echoed this, adding that having technical staff identified as spokespersons in advance is a good practice.

## 5. Conclusions

The Leibstadt case shows how very important it is to use language that is clear and understandable to the general public. Information should be unambiguous. The key challenge here is to avoid simplification that leads to inadmissible inaccuracies. Everyone involved in the workshop discussions saw this as a major challenge. It was also important to ensure that there were sufficient resources, such as colleagues on the communications team, as well as subject experts within the institution for possible inquiries from the communications team, to deal with the influx of questions and the high-level of public interest at the peak of the event.

Graphics are a helpful tool to make facts more understandable. However, these graphics must be easy to understand and yet still be accurate. Here, as with text, it is important that they cannot be misinterpreted.

The language used in words and pictures must be easy to understand but should not contain public relations jargon. Those involved in the communication effort should not beat around the bush and should not gloss over facts. Otherwise, credibility can be lost.

The media has its own agenda. As a state authority, reliable information should be provided as possible as part of any research in order to prevent incorrect reporting. To what extent it makes sense to agree to an interview depends on whether the authorities can actually convey their messages in the interview. If there is a risk of the interview being abused, authorities should refrain from getting involved.

If media reports are incorrect, it is important to ensure that the correct facts are made available to the public quickly on all available channels and that the reporting is corrected. Waiting patiently only helps consolidate misconceptions.

## Annex

### *ENSI web article*

19 December 2016

#### **Findings on fuel elements in Leibstadt NPP: ENSI is classifying the incident as INES 1 and checking the submitted measures**

**An inspection of fuel elements in Leibstadt NPP revealed that critical boiling states – so-called dryouts – had systematically occurred over several cycles. The Swiss Federal Nuclear Safety Inspectorate (ENSI) is classifying this incident as Level 1 on the INES. It is currently checking the documents and actions submitted by KKL last week.**

Following a comprehensive root cause analysis conducted in 2015, Leibstadt NPP discovered that fuel rod damage dating from 2014 is attributable to dryout. If dryout occurs, the fuel rods are no longer completely covered by a film of water, since the water has already vaporised into steam. Such “dry” areas become very hot and are therefore oxidised more severely.

Subsequently, Leibstadt NPP took measures to prevent such dryout occurring during the 2015/2016 cycle. However, inspection of the fuel elements as part of the 2016 annual outage once more revealed heavily oxidised areas on fuel rods caused by dryout.

The core of Leibstadt NPP consists of a total of 648 fuel elements, each with 91 or 96 fuel rods, depending upon the element type. The root-cause analysis involved inspecting more than 200 fuel elements with nearly 20 000 fuel rods from different cycles. Findings were discovered on 47 fuel elements and it was established that dryout had obviously occurred after the 2012/2013 cycle. The findings are up to 26 cm in length. The fuel rods in Leibstadt are around 410 cm long.

#### **No danger to the environment**

The findings discovered on the fuel elements in 2016 did not lead to any release of radioactive materials into the cooling circuit and consequently no radiological limits were exceeded. Similarly, they did not cause the safety equipment to respond. However, overall, the safety implications of the incident are regarded as significant for the nuclear operation. For this reason, ENSI is classifying the systematic occurrence of dryout as Level 1 (Anomaly) on the INES.

In order for Leibstadt NPP to be allowed to start up again, the core loading and reactor operation must be such as to exclude dryout during normal operation, in the event of operational malfunctions and in accident categories 1 and 2 of the design basis accidents.

#### **ENSI is checking documents**

Mid-December, the nuclear power plant submitted a report and ENSI is currently checking it, together with further operating documents that have been submitted. ENSI is calling in various experts to assess the facts and is also involved in international exchanges on the

subject. Moreover, ENSI has kept itself up-to-date with the work at Leibstadt NPP by means of inspections and dedicated technical discussions.

#### **[+] Additional requirements**

Additional requirements imposed by ENSI over and above the direct guarantee of safe reactor operation:

- ENSI must be provided with a report on the suitability for disposal of fuel rods or fuel elements which have oxide layers that exceed the thickness specified for allowed burn-up. This report must include suitability for transport, interim storage and final disposal, as well as stating the quantity of rods or elements affected. (Deadline: Autumn 2017)
- In view of the described findings observed on several fuel elements in this incident, an independent, more detailed and cross-departmental analysis must be carried out, taking account of M&O aspects (HOF analysis). In particular, this must also take account of interfaces with external bodies and/or in-house departments. The results of the technical root cause analysis (technical RCA), which is being conducted as part of the BELDO project, should be included in or added to the required HOF analysis. The results are to be submitted to ENSI. (Deadline: Autumn 2017)

#### **Other Swiss plants so far unaffected**

Based on current knowledge, it is not yet possible to say whether this anomaly can also occur in other boiling water reactor facilities. So far, the inspection of fuel elements in Mühleberg NPP has not revealed any indication of increased oxidation of the fuel cans as a result of dryout.

Because of the difference in the way that Boiling Water Reactors and Pressurised Water Reactors operate (PWR), there is no transferability to the PWR plants – Gösgen and Beznau.

([www.ensi.ch/en/2016/12/20/findings-fuel-elements-leibstadt-npp-ensi-classifying-incident-ines-1-checking-submitted-actions/](http://www.ensi.ch/en/2016/12/20/findings-fuel-elements-leibstadt-npp-ensi-classifying-incident-ines-1-checking-submitted-actions/))

#### **Dryout: Preventing inadequate cooling of fuel rods**

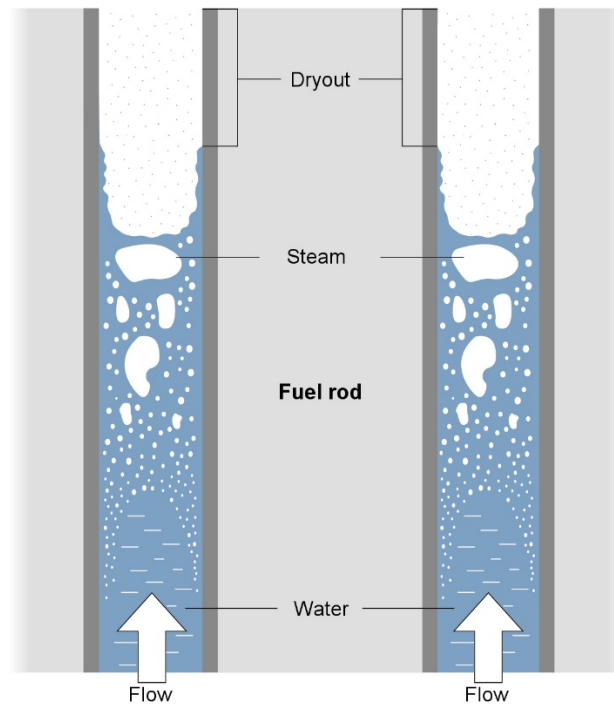
Heat is generated in fuel rods in the reactor as a result of nuclear fission. This heat is dissipated via the coolant (water). To guarantee optimum cooling of the fuel rods, their cladding tubes must always be covered with a film of water. If they are not completely covered with water in specific areas, this is referred to as “dryout”.

The water, flowing through the reactor fulfils two purposes: on the one hand, it moderates the neutrons to maintain the controlled chain reaction (nuclear fission); on the other hand, it cools the fuel rods, which are combined in bundles to form fuel assemblies. Cooling goes hand-in-hand with heat removal from the reactor. In a boiling water reactor, the water boils. The resulting steam is sent directly to the turbine.

To guarantee adequate cooling of the fuel rods, they must be permanently covered with a film of water. If this is not the case, this is referred to as dryout, i.e. drying out of the liquid film along the cladding tubes. This reduces the heat transferred to the coolant, causing the

fuel rod to heat up even more. The cladding tube surrounding the fuel rod is then likely to undergo oxidation at a much quicker rate. If this situation continues for a long time, the fuel rod may lose its integrity and become damaged.

**Figure A1. Illustration of dryout**



### **Dryout prevention limit**

A so-called thermohydraulic limit (Critical Power Ratio (CPR)) is applied in boiling water reactors to prevent dryout. This limit forms part of the technical design of the reactor and is monitored continually. Reactor operators are required to ensure that they always comply with this limit during operation of the reactor.

During annual outages of nuclear power plants, a selection of fuel assemblies used during the previous cycle is inspected. Among other things, these inspections include looking for signs of higher oxidation on the fuel rods. Any such indications, especially in the upper area of the fuel rods, may point to the presence of dryout.

([www.ensi.ch/en/2016/12/19/dryout-preventing-inadequate-cooling-of-fuel-rods/](http://www.ensi.ch/en/2016/12/19/dryout-preventing-inadequate-cooling-of-fuel-rods/))

**KKL: Fuel element findings – increased oxidation on fuel rod claddings, published 12 August 2016**

#### ***Relevant work/title***

Leibstadt NPP: Fuel element findings – increased oxidation on fuel rod cladding tubes,

#### ***Date/time***

12 August 2016

### ***Content***

In 2015, after an extensive root cause analysis, Leibstadt NPP identified that fuel rod damage from 2014 could be traced back to increased oxidation caused by dryout. The fuel element concerned was in its first cycle in the reactor. In the 2015 main annual overhaul, again increased oxidation was found on individual claddings on some fuel elements undergoing their first operating period, without damage occurring to fuel rods. To prevent dryout conditions for highly loaded fuel elements in the subsequent cycle, the power distribution in the core was flattened and the CPR limit increased. In the 2016 main annual overhaul, selected fuel elements, which had been in their first cycle in the reactor, underwent visual inspection. At the same time, in August 2016 increased oxidation was identified on a greater number of fuel elements. Consequently, KKL again increased the scope of the inspection and in total investigated over 200 fuel elements from various preceding cycles and from different fuel element manufacturers. Additional oxide thickness measurements yielded values of some 260 micrometres.

The fuel elements with findings have different common characteristics:

- Fuel element type and manufacturer.
- Occurrence in the first year of use in the reactor.
- The increased oxidation occurred in the top part of the fuel rods, below the topmost and second-topmost spacers.
- The fuel rods concerned were those next to fuel element corners.
- In these corners, there are partial-length fuel rods in the lower section.
- The areas of increased oxidation are up to 260 mm long.
- Only a small portion of the circumference of the fuel rods is affected.
- Position of the area of increased oxidation on the circumference of the fuel rods.

### ***Causes***

The immediate cause for the occurrence of increased oxidation is that the critical boiling state on the cladding surface has been reached. In this condition, the cladding surface in operation is no longer wetted with a coolant film (dryout), so that locally there is a major increase in the surface temperature. The rise in surface temperature causes increased oxidation of the cladding material.

The root cause analysis of why dryout could occur, is not yet complete. Possible influencing factors are:

- Design features of the fuel elements.
- Enrichment of the fuel in the individual fuel rods.
- Position in the reactor of the fuel elements concerned.
- Core design and calculation of the interval from the critical boiling condition.
- Power distribution and thermohydraulic conditions during the operating cycle.

### ***Classification (according to guideline [ENSI-B03](#))***

INES: Level 1

***Operator measures***

Fuel rods, which, according to the specifications of the fuel element manufacturer, were so strongly oxidised locally that they were no longer suitable for reuse, were replaced. The replacement was performed with a view to possibly reusing the fuel elements concerned. The replacement rods are made of zirconium, which is also used for the cladding. They do not contain any fissile material.

KKL, together with the manufacturer of the fuel elements concerned, has analysed and evaluated the inspection results in order to define safe design and operating conditions for the next cycle.

KKL has redesigned the core. The approval application for the intended new core loading was submitted to ENSI.

KKL, in conjunction with various external facilities, is continuing the investigations to determine the cause.

***ENSI measures***

ENSI has requested that KKL configures the core design and reactor operation in such a way that critical boiling conditions can be excluded during normal operation (safety level 1), during operating malfunctions (safety level 2) and during design case accidents (safety level 3) of fault categories 1 and 2 according to the regulations of the Federal Department for the Environment, Transport, Energy and Communications (UVEK) (SR 732.112.2).

ENSI has requested a report from KKL on the ease of disposal of the fuel rods (or the fuel elements containing them), whose oxide layer thickness is greater than the specified values for the targeted burn-up at the end of the planned period of use. In this respect, transport, intermediate storage, final storage and quantity must be considered.

ENSI has asked KKL to carry out an in-depth analysis, taking into consideration human and organisational aspects and to submit the findings to ENSI.

ENSI reserves the right to impose additional requirements as a result of possible further findings arising from the incident.

***Assessment by ENSI***

The findings identified relating to the fuel elements did not lead to a release of radioactive substances into the coolant circuit and no radiological thresholds were exceeded. Likewise, the safety equipment was not triggered. A failure of a cladding tube during power operation would have been immediately detected by continuous radiological process monitoring. Operation of the plant was not impaired. However, the safety significance of the event as a whole is classed as important for nuclear operational management because it led to the boiling transition power for individual fuel rods being exceeded. The incident led to a minor reduction in nuclear safety.

At this point in time, it has not yet been possible to perform an evaluation of the human and organisation aspects that led to or at least favoured this event.

***Criterion for inclusion on the ENSI website***

INES Level 1 or higher

ENSI informs the public in its annual oversight report about all reportable events relating to nuclear safety. ENSI continually publishes information on its website about incidents that meet one of the following criteria:

- INES Level 1 or higher
- Triggering of safety systems
- Incidents that would lead to core damage with a probability of more than 1 in a 100 million
- Incorporation of radioactive substances with a dose commitment of more than 1 mSv

*Issued: 19 December 2016*

([www.ensi.ch/de/2016/12/19/kkl-befunde-an-brennelementen-verstaerkte-oxidation-an-huellroehren-von-brennstaeben-vom-12-august-2016/](http://www.ensi.ch/de/2016/12/19/kkl-befunde-an-brennelementen-verstaerkte-oxidation-an-huellroehren-von-brennstaeben-vom-12-august-2016/))

*16 February 2017*

**ENSI issues Leibstadt Nuclear Power Plant approval to restart subject to conditions**

**Leibstadt Nuclear Power Plant can restart power operation after an extended annual overhaul. The Swiss Federal Nuclear Safety Inspectorate (ENSI) has checked the clarification of the causes and measures derived from it for the avoidance of critical boiling conditions or dryouts. After the circumstances that led to the dryout had been identified, the Supervisory Authority granted the release for restarting the plant subject to conditions. Safe operation without risk to humankind or the environment is ensured.**

“Safe operation of KKL is guaranteed and the plant fulfils the safety requirements of the legislative authority,” stated Ralph Schulz, Director of the Safety Analyses Division at ENSI. “Therefore, from the point of view of the Supervisory Authority, there is no reason why the Leibstadt Nuclear Power Plant cannot restart operation.” ENSI came to this conclusion after reviewing the application and the technical reports that KKL had submitted at the end of 2016.



**[+] Findings from the investigations**

The fuel element inspections yielded the following results:

- The dryout phenomenon has occurred since cycle 28 (2011/12).
- Dryout only occurred on (high power) fuel elements in their first year of operation inside the reactor and solely in two particular types of inflow positions.
- Dryout only occurred at the end of the cycle.
- Dryout indications were always found below the 7<sup>th</sup> and/or 8<sup>th</sup> spacer and always on the same fuel rods in the affected fuel element.
- The dryout indications always had the same fan-like shape, but differed in their dimensions. The length of the indications extended from a few millimetres up to 250 millimetres. In one case, the corrosion resulted in a leak.
- The resulting oxide layer varied in thickness. The maximum thickness was 260 µm.
- The dryout findings relate to only one of the four fuel element types used in KKL.
- The dryout findings lead to the conclusion that cladding tube temperatures were under 800° Celsius and that the condition lasted over a long period with an alternating loss of the coolant film followed by rewetting with coolant.
- Dryout only occurred if the fuel elements had been operated with a fuel element power of more than 7.4 megawatts.
- Dryout only occurred when the core flow was above 95%.

As part of the study into the causes, KKL undertook a wide ranging and systematic inspection programme on over 200 fuel elements to clarify which conditions led to the occurrence of the dryout.

“The study into the causes showed a clear and plausible pattern for the relevant influence quantities,” Ralph Schulz explained. From this pattern, the operator initiated measures that should prevent a renewed occurrence of dryouts. ENSI has checked these measures and assessed them as fulfilling the requirements. This means that the design and operation of the reactor core is now such that the conditions, that led to local dryout occurrences during the last cycles, no longer occur.

***Power reduction to avoid future dryouts***

As an operating and core design measure in the next operating cycle (up until the middle of September 2017), the core flow, i.e. the quantity of water that is pumped through the core, will be limited to a maximum 95%. Additionally, the power per fuel element for fresh fuel elements in the first cycle will be limited to 7.0 megawatts for continuous operation or 7.2 for short-term operation. This corresponds to a power reduction for the fresh fuel elements of around 20%. The consequence of these measures is that the thermal power of the Leibstadt reactor will have a maximum value of 95% at the start of the operating cycle that will fall by the end of the cycle to around 88%.

The advice of the experts of the Paul Scherrer Institute Paul Scherrer Institute (PSI) and Sten Lundberg Consulting (SLC) who were consulted by ENSI confirmed ENSI’s view that the measures of the operator are appropriate.

***Additional monitoring and safety measures***

If, contrary to expectations, fuel rod damage again occurs during the next operating cycle with an associated leaching of radioactive substances into the coolant, this would be immediately registered by the measuring systems.

As a condition for the approval for power operation it is specified that the Leibstadt Nuclear Power Plant must immediately shut down if an increase in radioactive waste gases is detected. These indicate fuel rod damage, irrespective of the cause of the damage. All fuel elements in the core must then be checked for leak-tightness. Normally an NPP would not be shut down due to fuel rod damage because of the low safety significance.

ENSI will also be regularly informed by Leibstadt Nuclear Power Plant of further progress in the detailed analysis of the physical mechanisms involved. Moreover, in the next annual overhaul, KKL will again perform an extended inspection of the fuel elements.

***There was never any danger for mankind or the environment***

There are operational limits for the contamination of the coolant that must be complied with in the event of fuel rod damage. These were a long way from being breached. “All these measures ensure that the protection of mankind and the environment is ensured,” emphasised Ralph Schulz. He also pointed out that even with the dryouts, thanks to the multi-barrier system and the defence-in-depth provisions there was no danger.

***Overhaul performed in line with requirements***

Leibstadt Nuclear Power Plant was shut down on 02 August 2016 for its annual overhaul. The long shutdown can be traced back to the massively extended inspection programme that was instigated at short notice for analysis of the dryout causes. Alongside the extensive fuel element inspection, the operator performed a range of maintenance work and periodic inspections. The reactor core has been newly configured. Eighty four spent fuel elements of the total 648 fuel elements were replaced by fresh fuel elements.

Experts from the Swiss Association for Technical Inspections and ENSI specialists checked the work on the plant after completion of the annual overhaul. Based on a number of inspections ENSI was able to reliably establish that consistent and legally compliant radiological protection was implemented by KKL during overhaul shutdown.

The checks and inspections did not uncover any finding that would call into question restarting ready for the next operating cycle or safe power operation.

([www.ensi.ch/en/2017/02/16/ensi-issues-leibstadt-nuclear-power-plant-approval-to-restart-subject-to-conditions/](http://www.ensi.ch/en/2017/02/16/ensi-issues-leibstadt-nuclear-power-plant-approval-to-restart-subject-to-conditions/))

**“Cladding tube damage poses no risk to mankind or the environment”**

**The Swiss Federal Nuclear Safety Inspectorate (ENSI) has issued Leibstadt Nuclear Power Plant (KKL) approval to restart subject to conditions. The conditions under which dryouts have occurred at KKL are known. KKL has instigated counter measures. Consequently, operation is safe. In an interview Ralph Schulz, Director of the Safety Analyses Division, shares some background insights.**

***Was there ever a risk for mankind or the environment due to the dryout phenomenon at Leibstadt?***

No. Cladding tube damage poses no risk to mankind or the environment. Fuel rod damage is a well-known phenomenon. Dryout is just one of the causes that can lead to fuel rod damage. The cladding tubes of the fuel rods form the first of several barriers that protect the environment against radioactive fuel and its fission products. Dryouts lead to accelerated oxidation of the cladding tubes and consequently reduce their strength. Obviously the barriers should not be weakened. Therefore, dryouts are not permitted under

normal operation. The dryouts at KKL resulted in actual cladding tube damage just once in 2014. In all other cases the result was solely reductions in the wall thickness or discolouration.

***Can a reactor go out of control because of dryout?***

Contrary to the claims of some nuclear power critics, dryouts do not result in an uncontrolled increase in reactor power and hence a safety problem. If fuel rod damage does occur, it is easily detected and the plant can be safely shut down. Normally however an NPP is not shut down in the event of fuel rod damage because its effects are marginal. Fuel rod damage is rare but not unusual. In KKL for example there are about 62 000 fuel rods in the core.

***Today you issued an approval to Leibstadt Nuclear Power Plant to restart operation. Does that mean that you know the cause for the oxidation of the fuel rods?***

We know the conditions under which a dryout occurs in KKL. Based on this, KKL has been able to configure the reactor and its operation in such a way that these conditions are specifically excluded. KKL has performed a cause analysis based on a systematic examination of more than 200 fuel elements. It is generally known that the power, design type and position of fuel elements together with the core flow, i.e. the quantity of water that is pumped through the core per unit of time, play a decisive role in dryout phenomena. Now the comprehensive investigations have provided actual values for these parameters. Other possible causes for the dryout, for example manufacturing errors, were previously unambiguously excluded.

***Nevertheless, KKL must continue with the analysis. Does that mean there are still unknowns?***

In many technical applications individual physical phenomena play a role but are not fully understood and therefore mathematically can only be described to a limited extent. This applies for example whenever there is turbulent flow or for every heat transfer scenario. Nevertheless, the processes taking place can frequently be explained in general even without consideration of the detailed physical processes and as such can be technically safely exploited because they are sufficiently investigated. In this way the detailed physical mechanisms leading to dryout in KKL are also not yet known. The findings so far are largely empirical. Therefore, we have asked KKL to perform further investigations to improve the understanding of the detailed physical processes which, under defined boundary conditions, result in local cooling deficits and in this way provide further assurance for the findings obtained until now.

***In 2015 measures had already been taken that should have prevented a dryout. However, the 2016 overhaul outage revealed that these were not successful.***

The measure to increase the margin relative to the critical boiling transition power in operating year 2015/16, was taken based on the computer model used up until now. This model is used globally in many boiling water reactors. As has now been revealed however, it does not cover all the individual phenomena. However, thanks to the comprehensive analyses of the past few months, the operator now knows the most important parameters that play a role in dryout and can now take them into consideration in the configuration and operation of the reactor.

***You mentioned the core flow. Are we talking about a cooling problem here?***

No. The cooling technology of a boiling water reactor is tried and tested. This is apparent from plants with a similar design. The cause for the dryout is the interaction between the core flow, power and design characteristics of the plant and the fuel element.

***Was the fact that there was too little water in the reactor pressure vessel responsible for the fuel rods being able to dry out?***

No. The level was correct at all times, which means that the level was always well above the top of the fuel rods. Locally however, there were conditions under which the normally present water film was lost on a few fuel rods at least temporarily and the heat was directly transferred to the steam. This led to a significant increase in cladding tube temperature.

***Until now there has been one case, in 2014, in which a fuel rod dryout went so far that radioactive material escaped into the coolant. What exactly happens, if the cladding is corroded through? How large was the fraction of the reactor core that was affected by corrosion?***

The reactor core of the Leibstadt Nuclear Power Plant comprises 648 fuel elements with a total of around 62 000 fuel rods. In total, of the fuel elements used in the 2015/16 operating year, 30 fuel rods in 13 fuel elements were affected by dryout to such an extent that they required replacement. That is about 0.05% of the fuel rods in the core.

***Are there still any oxidised fuel rods in the reactor?***

Oxidation on fuel rod cladding tubes is an entirely normal process. This mechanism is allowed for by the design of the fuel rods. As part of visual inspections and measurement tests, the adherence to limit values is regularly checked. For those fuel elements that have fuel rods exhibiting heavier signs of oxidation but which otherwise can remain inserted, these fuel rods are replaced by zirconium rods without uranium.

***Can you state that there will not be any dryouts before the next annual overhaul?***

As we now know the boundary conditions that led to the dryouts and the measures taken, we are convinced that a recurrence can be excluded. However, KKL must check extensively during the next overhaul whether local cooling deficits have again occurred.

***Leibstadt Nuclear Power Plant had already had problems with fuel rod damage at the end of the 1990s.***

No. The mechanisms that led to the fuel rod damage are different. The corrosion found at that time was in the area where the fuel rods are covered by the spacers. The failure mechanism at the time was so-called shadow corrosion, which could be traced back to an unfavourable combination of cladding tube and spacer material. Thanks to the continuous development of the material composition, this failure mechanism has not returned since then at KKL.

***Since starting operation in 1984 KKL has increased its output several times. Is there a connection between the dryouts and these increases in output?***

There are multitudes of factors that influence the occurrence of dryout. Undoubtedly, the reactor output is one of them. However, tracing the dryout solely back to the increased output would be incorrect and an over-simplification. The last increase in output took place in 2002. The analyses have shown that the dryouts first occurred in cycle 28, i.e. not until

2012/13. Between these times, operating experience in respect of the reactor core was positive.

***Have you called upon the assistance of external experts, for example the Expert Group on Reactor Safety (ERS)?***

With its Reactor Core Section, ENSI has its own proven expertise in the field of reactor and fuel technology. For specific questions, we called upon experts from TÜV Süd, the Paul Scherrer Institut PSI and Sten Lundberg Consulting SLC. We have used the Expert Group on Reactor Safety primarily to consider long-term strategic safety questions. The findings in respect of the fuel elements relate more to day-to-day operations.

***Elements of the media have accused ENSI of covering up the problems with fuel rods in the nuclear power plant up to last December.***

ENSI continuously informs the public about the state of the Swiss NPPs. Thus, for instance ENSI reported on the findings on the fuel elements in its 2014 and 2015 Oversight Reports. Moreover, we referred to the problem in our web article linked to the 2014 Oversight Report. According to the legislative authority, the licence holder is responsible for the safe operation of an NPP. KKL informed the public repeatedly and promptly about the findings on the fuel rods during the 2016 annual overhaul. For its part, ENSI informed the public after handling of the incident was completed. Up until this point, the Supervisory Authority was not in a position to communicate about the decisions or handling approaches that would have supplemented the information provided by the operator.

***Leibstadt Nuclear Power Plant had already made it known in autumn 2016 that it wanted to restart operation in mid-February 2017. Furthermore, the lakes used for hydroelectricity appear emptier than ever. Was this a factor in your decision?***

No. The core of ENSI's work is the protection of man and the environment against the dangers of peaceful use of nuclear energy. In Switzerland, nuclear power plants can only be operated if they fulfil the requirements of the legislative authority. This is the sole focus for ENSI.

([www.ensi.ch/en/2017/02/16/cladding-tube-damage-poses-no-risk-to-mankind-or-the-environment/](http://www.ensi.ch/en/2017/02/16/cladding-tube-damage-poses-no-risk-to-mankind-or-the-environment/))

***KKL media releases<sup>15</sup>***

*02 August 2016*

***Leibstadt nuclear power to shut down for maintenance***

*Today, Tuesday, 02 August 2016, Leibstadt NPP (KKL) will go offline and shut down for its nearly four-week annual maintenance.*

During the next four weeks nearly a fifth of the fuel elements will be replaced and various maintenance work and comprehensive checks on components, valves and systems undertaken. In doing so, the over 500 employees of KKL will be supported by around 1 000 external specialists.

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15. Translation of the original German media releases by the NEA.

22 August 2016

***Extension of the annual main maintenance shutdown***

*Findings in the cladding material of eight fuel elements in the core of Leibstadt NPP are resulting in an extension of the annual maintenance shut-down of about eight weeks. Fuel element integrity is not affected.*

As part of the planned fuel inspection during the current main annual maintenance, local discolouration of the cladding tubes was found for eight fuel elements. These discolouration areas are signs of oxidation in the cladding tube material. In the event of findings such as these, the fuel elements in question are reanalysed and reassessed.

The analyses have now revealed that the oxidation layer is already so far advanced that the affected fuel elements cannot be used again for the next operating cycle. The insertion of new fuel elements means that the reactor core must be redesigned and reloaded for the next operating cycle. This process, involving extensive calculations and safety analyses, is very complex and time-consuming and will result in a delay of provisionally eight weeks for the 2016 main annual maintenance.

The integrity of the fuel element cladding tubes was always guaranteed. The identified discolouration of the fuel elements does not constitute a safety risk for humans or the environment. ENSI has been informed about the indications and the next steps.

06 October 2016

***Reloading of the reactor core requires more time***

*The findings of the inspection of the fuel element and the reloading of the reactor core is taking more time than planned. Therefore, restarting is provisionally delayed until February 2017.*

During this year's main annual maintenance, local discolouration areas (signs of oxidation) were detected on the fuel element cladding tubes, i.e. on the fuel rods. The necessary inspections led to an extension of the main annual maintenance. Since August, visual inspections as well as oxide layer measurements have been performed. Now it has been revealed that more fuel elements have indications and the restarting of the plant will only be possible with a new core design.

Over the coming weeks, the fuel elements with indications will be repaired or replaced. In parallel, calculations on the new core design and the necessary safety calculations will be performed and submitted to the Swiss Federal Nuclear Safety Inspectorate (ENSI) for approval. According to the current schedule, the core will be reloaded and the plant prepared for restarting in January 2017.

In the meantime, the cause analysis will be continued in collaboration with the fuel element manufacturers, the reactor manufacturers and external experts.

Provisionally KKL will go back online in February 2017 after the Swiss Federal Nuclear Safety Inspectorate (ENSI) has granted approval for restarting.

19 December 2016

***Safety assessments completed and application for approval of the new core loading submitted***

*Leibstadt Nuclear Power Plant (KKL) has completed inspections of the fuel elements and evaluated the findings. All analyses and safety assessments as well as the application for the approval of the new core loading and core operating mode have been submitted on schedule to the Swiss Federal Nuclear Safety Inspectorate (ENSI).*

During this year's main annual maintenance, local discolouration areas (signs of oxidation) were detected on the fuel element cladding tubes. This led to a prolonged shutdown of the plant. Comprehensive inspections have been performed over the last few weeks. Of the total of 648 fuel elements in the reactor core, 47 fuel elements exhibit discolouration on a few cladding tubes. The findings are located at specific positions in the core and affect only fuel elements in the first operating cycle. For 15 of the more significantly affected fuel elements, 32 of the total 62 208 fuel rods were repaired by replacing the affected cladding tube with a zirconium rod without uranium.

The safety assessments of all inspection data, analyses and expert opinions, which are necessary for a new core loading and core operating mode, have been completed and submitted to ENSI.

KKL is convinced that the conditions for safe operation in the new operating cycle exist. After approval by ENSI, the reactor core is to be loaded for the next operating cycle with both new as well as existing and repaired fuel elements.

According to the current schedule, the core should be loaded in January and the plant prepared for restarting. The detailed cause analysis will be continued in parallel in collaboration with the fuel element and reactor manufacturers and external experts.

ENSI has classified the indications on the cladding tubes as INES 1 (anomaly) on the International Nuclear Event Scale.

16 February 2017

ENSI grants approval for restarting with reduced power

*The conditions under which oxidation can occur on individual fuel elements in the Leibstadt Nuclear Power Plant (KKL) are known. Various actions will ensure that no new oxidation events will occur in the next operating cycle. Among other things, the power plant output will be reduced. KKL has provided the safety proofs and received approval from the Swiss Federal Nuclear Safety Inspectorate (ENSI) for restarting of the plant.*

The oxidation areas identified in the summer of 2016 can be traced back to a local cooling deficit, referred to as dryouts. In this phenomenon, fuel rods were temporarily and sporadically no longer fully covered by the normal water film resulting in a localised increase in temperature and an increase in the oxidation of the cladding tubes. In spite of these temporary dryouts, wetting of the cladding tubes was always ensured and the temperatures only increased to the extent that there was a growth in the oxide layer, not however damage to the cladding tubes. The areas of oxidation pose no risk to humans or the environment. The plant fulfilled all safety requirements at all times.

The approval of the Swiss Federal Nuclear Safety Inspectorate (ENSI) to restart the plant is based on comprehensive safety proofs that KKL has submitted to the regulatory authority.

The conditions under which oxidation occurred on individual fuel elements at KKL are known. Based on the extensive inspection programme that was carried out during the shutdown, it was shown that the oxidation events would not occur at reduced fuel element power and limited core flow. Against this background, KKL has accordingly adjusted the design and power of the 84 fuel elements that are being newly inserted for the coming operating cycle. Moreover, the maximum core flow is specified at 95%. As a result, the total reactor power will be limited to about 90%.

In this way, KKL is preventing the conditions that could lead to local dryouts during the next operating cycle. In addition, the in-depth cause analysis continues to obtain more detailed knowledge about the fuel element findings. Accordingly, KKL specialists are working in collaboration with the fuel element manufacturer, the reactor manufacturer and international experts. The focus of the investigations is the physical processes in the reactor core and the in-depth analysis of the operating parameters.

To check the effectiveness of the actions carried out, targeted fuel inspections will be carried out at the next main annual maintenance shutdown in autumn 2017.

Over the coming days the plant will recommence power operation after successful implementation of all safety tests.

### ***Greenpeace media releases***

*23 August 2016*

#### ***Is the fuel element damage in the Leibstadt NPP homemade?***

*The damage to the fuel elements in the Leibstadt Nuclear Power Plant are probably caused by the operator. Greenpeace Switzerland demands complete clarification of the incident.*

Eight fuel elements are damaged in Leibstadt NPP and must be replaced, as the operator announced yesterday. This will result in an unplanned forced shutdown of two additional months. This means that, combined with the standard maintenance shutdown, Leibstadt will be completely shut down for a total of three months this year.

#### ***First such case***

The findings in the Axpo Leibstadt power plant should be a first within Switzerland, “There has yet to be such a serious problem with fuel elements in a Swiss NPP,” states Florian Kasser, nuclear expert with Greenpeace Switzerland. “According to our knowledge, there has never been such a fast oxidation process that has happened simultaneously to multiple fuel elements.”

#### ***What is the cause?***

Leibstadt is not saying what the cause of the damage to the fuel elements is. Cause for worry is the fact that the rust-like damage apparently occurred within just one operating year. “One possible cause is an incorrect chemical composition of the cooling water,” states Kasser. Also the design of the core, that is the manner in which the fuel elements are arranged, could have led to the damage. Manufacturing defects would be a surprise, because for many years, the nuclear industry has worked to improve material quality and consequently the trend has been one of constant improvement.



***No harmless findings***

Damage to the fuel elements must be taken very seriously. “The failure of a fuel element can result in radioactive contamination of the primary circuit,” says nuclear expert Kasser. In the worst case, a severe accident might result. Therefore, Greenpeace Switzerland is calling for a complete investigation into the incident before a decision is made about restarting Leibstadt NPP.

06 October 2016

***Did Leibstadt try to get every last drop out of the tank?***

*The fuel element damage in Leibstadt NPP is more serious than previously recognised and will lead to a longer shut-down, lasting until at least February 2017. Greenpeace Switzerland reacted to this message with some concern and is calling for a full and transparent explanation of the causes.*

More fuel elements are damaged in Leibstadt than was known at the time of release of a statement in August. Florian Kasser, Greenpeace Switzerland’s nuclear expert is worried about the indications: “The fact that more damaged fuel elements exist, contributes to the assumption that the operator is responsible for this mess.”

***Reactor more heavily loaded***

Leibstadt is remaining coy about possible causes of the damage; the cause analysis is continuing. This raises the question of whether the increase in power by Leibstadt NPP caused or contributed to the problem. Since commissioning, the power has been increased by about a third. This means that the reactor is more heavily loaded than was originally planned. The power was also increased during the last few years. “Possibly Leibstadt is now reaping its reward for trying to get the last drop of fuel out of the tank,” comments Florian Kasser.

***Transparent process required***

Greenpeace Switzerland is requesting the nuclear regulatory authority ENSI and the operator of Leibstadt to ensure all known information is out in the open. “We regret that ENSI has not issued a statement on the incident since August. Experts and the general public must be able to understand exactly what happened at Leibstadt,” says Kasser. It is particularly important that the public be comprehensively informed about the problem especially against the background of the vote on an ordered to phase out nuclear power.

23 November 2016

***Extent of the fuel element damage in Leibstadt requires external expert panel***

*The fuel element damage in the Leibstadt NPP is constantly growing in scope. As became known today, rust-like oxidation has already been found on 45 fuel rods, after just one-third of them have been examined. Greenpeace Switzerland views this development with increasing concern and demands that an external panel of experts be called upon.*

At the end of August this year, the operator of Leibstadt NPP (KKL AG) stated that eight fuel elements have been discovered with accelerated oxidation. Just over a month later, there were indications that the scope of the damage is much greater: Restarting was provisionally delayed until February 2017. In the meantime, a third of the reactor’s fuel rods have been examined as KKL AG [informed the “Aargauer Zeitung” newspaper when questioned](#). In the process, at least 45 fuel rods were found with this rust-like damage.

“According to my knowledge, this is a negative record at European level, if not global level,” states Stefan Füglistner, nuclear expert for Greenpeace Switzerland about the extent of the damage.

### ***Over a quarter of a billion loss***

Nuclear expert Füglistner calculates that the damage will have far-reaching consequences for the NPP: “If the investigations continue to take up so much time, then Leibstadt will have to come back online later than scheduled,” he estimates. The financial damage would grow to more than a quarter of a billion Swiss francs as a result.

Before restarting can be considered, the cause of the damage must first be clarified. Greenpeace Switzerland is calling for a complete explanation in a transparent process. Due to the huge scale of the damage, an external panel of experts should also be consulted, as occurred in the case of weak points in the reactor pressure vessel of the Beznau NPP. “With problems of this magnitude, an independent second opinion is essential,” states Füglistner. Recently the ENSI nuclear regulatory authority itself has acted in a very misleading manner in its estimation of the situation, approving operation in the summer of 2015 in spite of the cause of detected fuel element damage not having been clarified.

### ***Continued operation only with power reduction?***

One possible cause for the oxidised fuel rods is the successive increases in power that have been implemented at Leibstadt NPP. Füglistner expects that continued operation will only be possible with a power reduction of about 15%. According to Stefan Füglistner “This would, in turn, further increase the losses of the already loss-making NPP.” The additional loss would be an estimated 50 million Swiss francs per year.

19 December 2016

### ***No experiments in Leibstadt!***

*The operator of the Leibstadt Nuclear Power Plant has submitted a report on the fuel element damage to the ENSI nuclear regulatory authority requesting approval for restarting with a new core load. The Leibstadt operator is doing this without a comprehensive understanding of the causes. Greenpeace Switzerland condemns this approach and calls for the publishing of the report.*

At the end of the annual maintenance shutdown of Leibstadt NPP, talk was of eight damaged fuel elements, but now there are six times as many. 47 findings on new fuel elements, after only one year in use, implies a new dimension in nuclear technology at this scale.

To play things down, the Leibstadt operator is referring solely to “Discoloured cladding tubes”. Under consideration here is early, rust-like oxidation. This in turn represents a weakening of the first safety barrier. The cause of the fuel element damage is referred to as a “dryout” – drying out of the surface, which points to inadequate cooling of the fuel elements. “This can lead to overheating and expansion of the uranium fuel, a phenomenon that is far from harmless,” says Stefan Füglistner, nuclear expert for Greenpeace Switzerland.

### ***Causes still hidden in the dark***

Neither ENSI nor Leibstadt are currently making anything known about the actual cause or reason for the “dryout”. The information from the Leibstadt operator indicates that they are still very much in the dark as to the reason. The cause analysis is ongoing, states the media

release. However, Greenpeace Switzerland considers that it is unacceptable that the NPP is still requesting the green light for restarting from ENSI. Füglistner continues “Bringing Leibstadt back online without first knowing the cause of the fuel element damage would be simply negligent.”

***Do not repeat errors***

Obviously, the Leibstadt operator is building on established practice and the willingness of ENSI to co-operate. Last year, the Supervisory Authority approved restarting in spite of a lack of clarification about fuel element damage and was very misleading in its assessment of the situation:

This more conservative safety limit means an increased gap relative to the critical boiling conditions and thus a reduction of the risk of further excessive cladding tube oxidation or cladding tube damage.

Today we know: the opposite was the case. Instead of less damage, as ENSI assumed, the number of findings multiplied. Greenpeace Switzerland is calling for the nuclear regulatory authority to now investigate more closely and only give Leibstadt a green light once the causes are clarified. Moreover, Greenpeace demands the publication of the operator’s report and checking of the documents by independent experts.

*02 February 2017*

***Negligent ENSI wants to allow Leibstadt NPP to go online again in spite of unclarified rust damage***

*Apparently, Leibstadt NPP can resume operation in mid-February. This in spite of the fact that the cause of the fuel element damage has still not been clarified, according to a ‘Rundschau’ report. Greenpeace Switzerland condemns the negligent approach of the ENSI nuclear regulatory authority and requests the publication of all documents concerning the incident.*

Leibstadt NPP has been shut down since the start of August 2016. The regular overhaul has been extended by nearly six months because nearly 50 fuel elements are affected by oxidation – similar to rust. The nuclear regulatory authority ENSI has requested more detailed analyses before the plant can go online again. According to the “Rundschau” of Schweizer Radio und Fernsehen (SRF) (review programme of the Swiss broadcaster SRF), the authority has now granted approval for core loading and the green light for restarting in the middle of February appears to be merely a formality. Apparently, the decision was made without knowing what has caused the oxidation or the inadequate cooling of the fuel elements (“dryout”).

***Unique extent of damage***

However, as ENSI itself has announced, the problem was discovered as long ago as the summer of 2015. According to statements made by Andreas Pfeiffer, Leibstadt power plant manager, in the Rundschau report, the reason for the damage is not yet clarified in spite of one and a half years of investigation.

“ENSI is acting very negligently, because the extent of this problem is unique on a worldwide scale,” adds Kasser. This ‘world première’ was confirmed by Pfeiffer in the television report. Consequently, there are no operating experience feedback values that the regulatory body can use to justify a restart approval for Leibstadt. “The announced power reduction may indeed ease the problem, but it by no means rectifies it,” says Greenpeace’s

nuclear expert, Kasser. The NPP operator has announced that the output of Leibstadt will be reduced by 120 megawatts, corresponding to a reduction of 10%.

### ***Situation misjudged***

Obviously, both the operator and the nuclear regulator have made mistakes and misjudged the situation. Greenpeace Switzerland is demanding the publication of all documents available to ENSI relating to the matter. The fuel element cladding affected by the oxidation represents an important protective barrier and must not exhibit any such damage. This failure would considerably increase the risk of the release of radioactive pollutants into the environment.

16 February 2017

### ***Leibstadt NPP: Risky resumption of operation***

*ENSI permitted the restarting of the Leibstadt NPP today. Nuclear expert Stefan Füglistner of Greenpeace Switzerland commented as follows:*

“ENSI is acting against its better knowledge and indeed is violating its own principles. The regulatory authority itself had demanded that overheating of the fuel elements (‘critical boiling conditions’) could be excluded.” In the ENSI original:

ENSI has requested KKL to configure the core design and reactor operation so that critical boiling conditions can be excluded under normal operation (defence level 1), under malfunctioning (defence level 2) as well as under design-based malfunctioning (defence level 3) for accident categories 1 and 2 according to UVEK regulations (SR 732.112.2). ([www.ensi.ch/de/2016/12/19/kkl-befunde-an-brennelementen-verstaerkte-oxidation-an-huellroehren-von-brennstaebe-vom-12-august-2016/](http://www.ensi.ch/de/2016/12/19/kkl-befunde-an-brennelementen-verstaerkte-oxidation-an-huellroehren-von-brennstaebe-vom-12-august-2016/))

Such fuel element damage was already detected as early as 2015. Nevertheless, ENSI approved restarting at that time. With the measures undertaken, ENSI and Leibstadt felt that they were erring on the safe side in respect of excluding further oxidation damage. The opposite was the case: in summer 2016, damage was again found, and of even greater extent.

“If ENSI now proceeds in a similar way, then this is a YES to free experimentation and a violation of any safety instructions,” says Füglistner. The 16 000-strong petition entitled “Leibstadt NPP should not be going online”, submitted today, and the safety concerns of the population are thus being trampled.

### ***Media release of the Swiss Energy Foundation***

06 October 2016

### ***The implementation of the nuclear power phase-out initiative is already becoming reality this winter***

*Due to problems in the reactor core, Leibstadt NPP will remain disconnected from the grid until February 2017. With the ongoing shutdown of Beznau I, the output from nuclear power plants this winter will be reduced by nearly half. Consequently, this year’s winter will be more demanding in respect of security of supply than that purported by the nuclear phase-out initiative.*

***Old NPP cluster risk***

The ongoing outage of Leibstadt highlights the problem of the principle promoted by the Swiss Confederation of “continue running for as long as safe” for existing NPPs: The diminishing reliability of the oldest complex of NPPs in the world is becoming a cluster risk for the power supply and leading to an increased dependence on foreign countries and to more imports. Nils Epprecht, Project Manager Power & Nuclear, summarises: “We cannot simply leave the replacement of nuclear power to chance. Security of supply needs a plan.”

***Challenges of the nuclear phase-out initiative comparatively minor***

The nuclear phase-out initiative requires the shutdown of Beznau I and II as well as Mühleberg by the end of 2017 (1 133 megawatt). One and a half times that amount has already been lost for this winter (Leibstadt+Beznau I 1 650 MW). With the important difference where supply is concerned that, with the initiative, replacement can be planned for and not, as at present, that new realities are simply imposed overnight.

***Without a plan for nuclear phase-out, replacement is falling by the wayside***

Switzerland has so far missed out on making progress with the expansion of new renewable energies and continues to trail behind European countries. With the increasingly frequent outages of ageing NPPs, there is a danger that this approach will now reap its problematic reward. Yet for those willing to build, funding is blocked and investment security continues to be denied for as long as it remains unclear when and which capacities of the large power plants will be removed from the grid.

16 February 2017

***Trial and error at Leibstadt NPP***

*ENSI has approved the restarting of Leibstadt NPP although the causes of the fuel rod dryouts remain unclear. Whether the power reduction ordered today by ENSI will actually combat the cause remains to be seen. This follows the principle of trial and error at the cost of reduced NPP safety. SES is calling for the Nuclear Energy Act to be amended.*

***Existing countermeasures without success***

Critical boiling conditions (dryouts) have been occurring at Leibstadt NPP since 2012. ENSI and the operator knew about these by 2014 at the latest. Since then, the operator has been running the NPP by the seat of its pants while trying to resolve the dryouts problem during operation. Only: All countermeasures taken so far have failed. In contrast: The dryouts have increased. The model calculations used by operator and regulatory body, which should have proven the effectiveness of the existing countermeasures, have proven to be incorrect in hindsight.

***Impaired safety***

Last December, ENSI assigned the continuing problems an INES incident scale level 1. Specifically, this means that the concept of progressive safety provisions is impaired. ENSI has now approved restarting, subject to a permanent power reduction down to 88% until the cycle end for the fuel rod insertion is reached. However, without a completed cause analysis there is still no certainty that the integrity of the protective barrier is fully guaranteed. According to information of the operator made known in the SRF-Rundschau programme of 01/02/2017, an in-depth cause analysis would take months or even years.

***Inadequate Nuclear Energy Act***

According to ENSI, model calculations performed specifically for Leibstadt NPP show that the integrity of the NPP can be guaranteed. Therefore, as according to ENSI no limits have been exceeded, the restart is legal. However, any model calculation that does not know the causes of a problem is based on unsafe assumptions. Nils Epprecht, SES Project Manager Power & Nuclear criticises: “The Nuclear Energy Act is too lax for our old reactors.” It allows Leibstadt NPP to remain online with unresolved problems.” SES is calling upon the Federal Council and Parliament to revise the Nuclear Energy Act so that existing safety gaps are closed for what is now the oldest fleet of NPPs in the world. An NPP with an unresolved level 1 incident on the INES scale should not remain online.