

From: [Malgorzata Sneve](#)
To: [Watson, Bruce](#)
Cc: [Kristin Elise Frogg](#)
Subject: [External_Sender] Halden
Date: Wednesday, June 03, 2020 3:34:25 PM
Attachments: [Information from IFE.docx](#)
[Summary report Corporate Investigation Project Hepatica 06.05.2020.pdf](#)

Dear Bruce,

I hope all is fine with you and your family.

I would like to refer to our earlier dialog about research at Halden and here we have some more information.

We are looking into the technical details on this, and we are awaiting the further investigation from IFE on these new issues. However you will find attached information on the project relevant for US/NRC. The customer is (b)
(4) and it concerns Fuel degradation/Fuel oxidation experiments in the time period 1994-1997.

In order to clarify how the results from the experiments has been used, we (and IFE) depend on information from the relevant customers. Such information is necessary also to be able to initiate protective measures if needed to avoid possible negative effects from the use of the test results. So please do not hesitate to contact DSA if you need a further dialogue on these matters.

Please also find attached a description from IFE on the performance of their internal investigation.

Please do not hesitate to ask me if you have any questions.

Best regards
Malgorzata

From: "Watson, Bruce" <Bruce.Watson@nrc.gov>
Date: Friday, 22 May 2020 at 18:16:11
To: "Malgorzata Sneve" <Malgorzata.Sneve@dsa.no>
Cc: "Kristin Elise Frogg" <Kristin.Elise.Frogg@dsa.no>
Subject: RE: Halden

Malgorzata,

In order to identify the best people to assist you, can you send the reports that identify the technical areas of concern. This will help me immensely. I hope the information is in English.

All the best to you and your colleagues,

Information from IFE:

(b)(4)

A CONFIGURATIONI SSUE

The customer is (b)(4)

The type of test is a Fuel degradation/Fuel oxidation experiments in the time period 1994 -1997.

The purportedly involved and affected IFAs are IFA 600, that failed, and was replaced by IFA 622. According to information obtained, the test IFA 600 failed due to a leakage from a valve. Instead of constructing a new valve that was dense; the design of the test for IFA 622 was changed. Allegedly, two sets of drawings were made, one for the customer, not showing the changes made, and one for IFE. According to the sources of this information, the physical folders for IFA 622 have been removed. A technical description of the alleged configuration issue has been provided from a source.

The actual time period is in accordance with the period mainly covered by the Investigation. The responses from the customer identified so far in the material reviewed, indicate both a possible safety issue and the need for informing the customer in accordance with the customer information model used towards the Affected Customers. Such a dialogue with the customer has been initiated.

2.3.1 Extract of information gathered

IFA-600 was according to interview information, the first in-core test performed in HBWR addressing the so called "Fuel Degradation" phenomena. The information further received, has described the following situation and incidents.

The IFA-600 test was intended to simulate a fuel rod primary failure. Thus, it was important to have the same water diffusion properties as in a real case. This meant that the water injection tubes in IFA-600 had to be made with the same diffusion properties as a micro-crack in a fuel rod in a commercial power plant. Interview

sources described this as a challenge, and there was a need to develop a new type of in-core water ingress valves, to be placed very close to the fuel rods; maximum 50 mm away from the rods. These valves were then intended to be opened after some irradiation time (typically a year or slightly more) to simulate a crack or fretting failure followed by water ingress into the fuel rod plenum.

For the IFA-600 test the in-core valves failed prematurely (after a few weeks) and the test was a complete failure, according to the sources, even if it allegedly provided interesting data, but on other phenomena than

intended. For the next test to be performed in IFA-622, the replacement irradiation rig and a new generation of in-core valves were developed and qualified in extensive qualification programs.

To avoid a new failure, it was decided not to use in-core valves, but rather replace them with regular valves located outside of the reactor. The valves were placed in the junction boxes in the reactor hall approximately 16 meters from the in-core test; not 50 mm as agreed with the customer. The diffusion properties were far off and the set up was not relevant for the simulation of a real case fuel failure, as it happens in a commercial reactor.

Drawings, photographs etc. were allegedly remade in double sets, showing both the design agreed with the customer, and the "as-built" test rig (the one that was used for the test with the out-of-specification diffusion properties).

Based on the initial information received so far, the interview statements and the review of correspondence between IFE and the customer, we assume that it is more likely than not that a configuration misconduct did find place in accordance with the initial basis for suspicion of misconduct.



KVAMME ASSOCIATES

When Integrity Matters

***Summary report of findings from the confidential
report on***

CORPORATE INVESTIGATION

into possible research misconduct

at

Institute for Energy Technology (IFE)

1 INTRODUCTION

IFE is an independent research institute established in 1948. IFE's nuclear research reactors in Kjeller and Halden have served research communities and customers in many countries, including research on energy and materials in Norway. IFE develops and produces cancer medicine, works on next-generation battery technology and solar, wind and hydrogen solutions. IFE contributes to low-emission petroleum technology and advanced digital solutions for management, security and communication.

Norway decided to engage in national and international nuclear science research and build reactor facilities in the early fifties. The building of the first reactor at IFE's location at Kjeller was funded by the Norwegian state. IFE's reactors were constructed for research-based activities.

IFE's contribution to international nuclear research from tests conducted in the Halden Reactor, is substantial. The main reason is the success and longevity of the OECD Halden Project, established in 1958. This project includes research on fuel and materials in the Halden Reactor and research on the human factors (MTO). The latter refers in simple terms to how people behave in control rooms during stressful situations.

IFE decided to close the Halden Reactor in 2018 and is now preparing for decommissioning. In this context, IFE received information from employees in the first half of 2019 alleging that research misconduct had taken place in certain projects conducted several years ago in the Halden Reactor. The projects in question were applied research projects carried out by IFE for several different customers on a bilateral basis.

IFE considered the information as a whistle blower report under IFE's internal whistleblowing routines. Based on this, IFE initiated a pre-investigation to gather facts and secure relevant documentation. The results of the pre-investigation were presented to IFE in the end of June 2019, and IFE's Board of Directors decided on this basis to launch a full investigation.

IFE immediately proceeded to a full scale external, independent corporate investigation. IFE has fully supported and facilitated the investigation with the explicit objective that the investigation should uncover all relevant facts.

IFE holds itself to the highest ethical standards related to its research and operations and has on this basis decided to be as transparent as possible about the findings of the investigation. This summary report has been prepared by the investigation as a description of the factual findings of the investigation.

At the same time, IFE is bound by the provisions of applicable law, including provisions to protect privacy and statutory confidentiality obligations. IFE has therefore asked the investigation to summarise the findings of the confidential investigation report in an open summary report; sharing as much as possible within the parameters of the applicable legal framework, including the Norwegian Nuclear Energy Act ("Atomenergiloven").

The investigation methodology, investigation mandate and the legal reservations and disclaimers are attached as Enclosures 1-3 to this summary report.

2 INVESTIGATION MANDATE

A mandate was established as a basis for the investigation. The investigation mandate included the initial allegations of research misconduct as well as all other potentially relevant indications of misconduct or unethical behaviour in IFE. The health, safety, security and environmental (“HSSE”) impact of the alleged misconduct was given a particularly high priority in the investigation.

The investigation mandate was broadly defined and included a full fact-finding process of the relevant projects, as well as a full technical assessment. Two independent and experienced technical advisors were appointed by IFE to carry out the technical assessment. The investigation was also requested to assess whether the identified issues are considered research misconduct and whether the OECD Halden Project was affected.

The investigation was completed in April 2020 with the submission of a final report to IFE, pending further follow up of some issues.

3 THE STARTING POINT FOR THE INVESTIGATION

Guided by the initial allegations, the investigation focused on the time period from 1990 to 2005. The information concerned four bilateral projects, carried out for several different customers. The relevant customers were notified at an early stage of the investigation.

At a late stage in the investigation, information emerged that another three bilateral projects may also be affected by the alleged misconduct. These potential new issues are currently being investigated and will be subject to the same investigative procedures as the projects already covered by the investigation. At this point, it is too early to draw any conclusions related to these issues.

The initial allegations concerned incidents of changes to temperature- and pressure data, misreporting of neutron flux, and a change in test configuration described as a flow reversal, all with alleged unsatisfactory or missing documentation and interaction with the customer.

The initial allegations have formed the basis for the investigation. The three main issues that the investigation has pursued can be described as follows:

1. Configuration issues

The investigation has investigated allegations that reactor conditions specified as part of the test requirements were misrepresented and misreported, to address delay or failure to attain the conditions set out in specifications.

2. Temperature issues

The investigation has investigated allegations that the conversion routine processing of raw data was influenced irregularly by specific algorithms, not visible or part of the normal conversion routine and not reported to the customers.

3. Flux issues

The investigation has investigated allegations of misrepresentation and misreporting of fast flux values and calculations.

4 THE CONCLUSIONS OF THE INVESTIGATION

Based on the investigative findings, the investigation concludes that there has been misconduct in four projects in the Halden Reactor for bilateral customers. This means that the investigation finds that four projects have been impacted by irregular changes of data and/or design. The findings mainly concern temperature issues and a configuration issue. No flux issues have been confirmed.

The investigation finds that for the identified projects, IFEs internal guidelines for such tests were not followed and that intentional deviations from test requirements and test routines were not documented as required. Failure to comply with the documentation requirements has several risks, such as insufficient information about former projects conducted or that material or products tested by IFE may be put to a physical and/or legal use not fit for purpose.

The investigation also found that the changes made were hidden, both internally at IFE and from the customers.

The investigation also found that changes to data and/or design appear to have been triggered by operational challenges experienced during the execution of the projects. There were typically two situations leading to implementation of irregular changes:

1. The project failed to meet test requirements and specifications, or
2. The project met with challenges during the design/testing and it there was a risk of undesirable consequences of delays, rebuilding rigs etc.

Investigation sources have explained that the Halden Reactor was a test reactor and that the normal procedure when failures and/or errors occurred during testing, was to report this to the customer and discuss possible solutions. The findings of the investigation demonstrate a practice which deviates from this norm for the projects in question. The investigation has not found any evidence that the changes to data and/or design were discussed with the relevant customers for these projects, however this cannot be ruled out.

The investigation was specifically mandated to review IFEs activities carried out under the OECD Halden Reactor Project. The investigation concludes that the OECD Halden Reactor Project has not been affected by any misconduct.

5 RESEARCH MISCONDUCT

The investigation has assessed whether the findings of misconduct are also considered as research misconduct. According to OECD's definition as well as applicable laws and regulations in Norway, the concept of research misconduct includes serious breaches of recognized ethical norms, fabrication, falsification, and the breach of documentation requirements and internal protocols. In the field of nuclear science, research misconduct could imply serious HSE concerns. Research misconduct could also have significant economic consequences.

Research misconduct is a serious matter and a breach of internationally recognized ethical norms. The misconduct took place prior to the Norwegian Research Ethics Act came into force. The investigation finds that the misconduct would have been considered research misconduct under the current Norwegian Research Ethics Act. This legislation was not adopted at the time the misconduct took place and the legislation does not apply directly. The recommendation of the investigation is nevertheless

that the principles of this legislation are applied to any internal measures IFE adopts to mitigate the risk that misconduct will reoccur.

6 HSSE IMPLICATONS

A key priority of the investigation has been to identify any potential HSSE implications. The mandate stipulates that "a technical investigation of the conditions, with focus on clarifying possible safety consequences for the nuclear facilities (...)" shall be performed.

IFEs own nuclear safety experts has reviewed the findings of the investigation and concluded that the misconduct has not had any negative safety implications related to operation of the Halden Reactor.

The two independent technical experts have reviewed the safety implications for other nuclear facilities from the findings of the investigation. Their initial conclusion is that "there is no safety significance" regarding two of the four projects.

For the two remaining projects, the experts have not drawn a conclusion on safety implications yet, as they await response from customers to their inquiries. This means that the investigation has not yet received all relevant information to fully assess the potential HSSE impact of the misconduct. The investigation continues its dialogue and exchange of information with the customers to enable a safety assessment for the remaining projects.

7 THE OECD HALDEN PROJECT

The mandate stipulates "evaluating and concluding whether the Halden Reactor Project is affected or not" by misconduct. The investigation has not found any evidence or indication that the OECD Halden Project has been affected.

The investigation has pro-actively inquired about any impact on the OECD Halden Project in interviews. No one has indicated any such impact. On the contrary, some have stated that they rule out any such impact. This has further been considered in reviews of e-mails and home folders.

The technical experts have conducted a targeted review of the OECD Halden Project; looking into a sampling selection of experiments and tests for OECD Halden Project projects. These were selected on the criteria that test conditions and methods were comparable to the bilateral tests affected by the misconduct.

8 OVERALL PICTURE

Based on the findings of the investigations, the investigation has carried out an assessment of the root causes of the misconduct. The investigation has not assessed all aspects of the IFE organization.

The investigation has presented reflections and conclusions connected with the relevant questions of "how" and "why" the misconduct took place. As part of such assessment the investigation has concluded several root cause elements and factors within three areas:

1. Organizational and operational issues
2. Quality assurances/ internal control issues
3. Cultural issues

The focus of a corporate investigation and root cause analysis through problem identification, is to understand why the event occurred, rather than who is responsible. The findings of the investigation nevertheless clearly indicate that one individual has been instrumental regarding the misconduct.

The investigation recommends for IFE to report the findings of the investigation to the relevant authorities for further investigation and follow-up.

9 RECOMMENDATIONS

According to the mandate, the investigation has provided several recommendations to IFE for internal measures to be adopted to address the risk of future misconduct. Adopting such measures will complement and reinforce IFE's already significant efforts to strengthen the safety and integrity culture and improving processes and routines at the institute. Recommendations include:

- As a basis to ensure an ethical working environment, IFE should conduct an integrity risk analysis, mapping integrity risks via an employee survey on ethical awareness, integrity, culture and working environment.
- IFE should ensure that the ethical guidelines are communicated to all employees in a clear and consistent way, and that all employees on all levels receives education and training.
- IFE should review its current code of conduct on ethical behaviour and integrity to ensure that its code of conduct is in line with best practice. The code of conduct should set out IFE's governing principles on integrity.
- The IFE code of conduct should address responsibility of ensuring proper ethical conduct and an effective and transparent structure for responsibility involving management, division leaders/research leaders, supervisors and the individual employee.
- IFE should, as part of their work on promoting integrity, transparency and preventing future misconduct, publish the factual findings of the investigation under the parameters of applicable law, including provisions to protect privacy and statutory confidentiality obligations.
- The severity of the findings indicates an obligation for IFE to consider whether they should be brought to the attention of the relevant authorities.

ENCLOSURE 1

INVESTIGATION METHODOLOGY

The investigation is conducted by independent and corporate investigation firm Kvamme Associates AS.

The investigation is performed according to the Norwegian bar association's guidelines for corporate investigations. Investigation guidelines governing the investigation process were set out in accordance with the requirement of these guidelines. Specific investigation guidelines have been set out for the investigation for the interviews executed, for the review of email and home folders and for the contradiction process. The methodology and guidelines adopted by the investigation has been reviewed and approved by IFE.

The investigation has been conducted in close co-operation with law firm Selmer AS to ensure legal compliance in all aspects of the execution of the mandate. Selmer has under legal privilege provided IFE with legal advice and submitted legal advice that was part of the mandate. Selmer has provided Kvamme Associates with resources for the investigative fact-finding process.

Technical and safety measures were the remit of the mandate independent and highly experienced international experts, who have provided advice to IFE in close collaboration with the investigation.

Kvamme Associates has used as a sub-contractor, the services of one of the largest e-discovery providers in the world. They ensure forensically sound data acquisitions, the confidentiality of the data and the integrity of the data management. The review of e-mails has respected applicable GDPR legislation and taken due care to protect the right of privacy for the individuals concerned. The selection is based on their alleged or assumed actual involvement in or knowledge of matters pertinent to the investigation. Being selected for review is no indication of liability or criticism.

The investigation established communication with the customers early on by authorization from IFE. In order to share and receive information in a constructive and expedient manner, the investigation established a model for the interaction with the customers:

- i) An introductory telephone conference with question and answer session
- ii) Agreement on a non-disclosure agreement (NDA)
- iii) A second telephone conference setting out information about the alleged misconduct with question and answer session
- iv) The investigation's submission of a draft interim report to the customer attached with a technical issues' questionnaire
- v) The customer's submission of answers to the questionnaire
- vi) Any follow-up issues

IFE has been consulted by the investigation on material decisions in the investigation. IFE has made available resources and support to the investigation and to retrieve physical and electronical stored information to the investigation.

The fact-finding process has been to search for, secure, systematize, analyse and organise information (fact finding). A considerable amount of physical and electronical documentation regarding the experiments has been secured and organized within the different investigative issues.

The objective for the documentation has been to reconstruct the phases of each bilateral projects:

- a) Negotiations
- b) Proposals
- c) Agreements and amendments
- d) Design and drawings
- e) Rig construction
- f) Calculations
- g) Reactor operations
- h) Data conversion processes from raw data to engineering read-outs
- i) On-going reporting of results to customers
- j) All correspondence between IFE Halden and customers
- k) Final reports of results

The objective of the fact finding is to facilitate a reconstruction of what happened. Seeing that changes were made, the question was whether that would be possible. But, as the common raw data file of the Halden in-reactor experiments was not corrupted, data reconstruction was attempted with the support of IFE employees in Halden. This exercise was successful and proved to be very useful for the understanding of the effect that the changes had on the results.

The primary sources in the fact finding have been interviews and physical documentation located in IFE's or its employees' files and archives as well as electronically secured documentation. Minutes from IFE Board of Directors meetings have also been reviewed. The investigation has conducted ca 60 interviews.

ENCLOSURE 2

INVESTIGATION MANDATE

The mandate for the investigation was set out by IFE as follows:

"The aim of the investigation is:

To document the alleged incidents and reconstruct the facts by:

Identify, secure and review relevant physical archived documentation.

Identify, secure and review relevant electronical archived documentation.

Plan, implement and document interviews with key persons (key persons who the investigation will target) and individuals who is able to provide additional information.

Plan, implement and document a technical investigation of the conditions, with focus on clarifying possible safety consequences for the nuclear facilities and for relevant authorities. This will be performed by an independent and experienced technical advisor.

Plan, implement and document a legal evaluation assessing whether the alleged misconduct is to be viewed as a scientific misconduct according to relevant laws concerning ethics.

Plan, implement and document a legal evaluation of the contractual situation between IFE and the involved customers.

Plan, implement and document necessary investigations for evaluating and concluding whether the Halden Reactor Project is affected or not.

Ensure appropriate external and internal communication throughout the entire investigation.

Ensure adequate processing of all information in general and personal information, both during and after the investigation is ended.

Clarify and advise of eventual necessary internal measures to minimize the risk of future misconduct.

Clarify and advise eventual need for taking legal actions or other measures towards employees.

Contribute to IFE's ongoing contact with the authorities regarding the investigation. "

ENCLOSURE 3

LEGAL RESERVATIONS AND DISCLAIMERS FOR THIS SUMMARY REPORT

The investigation has been undertaken with all reasonable skill, care and diligence within the terms of the mandate and the terms of engagement with Kvamme Associates, Selmer and the experts.

All statements are based on the investigation's interpretation of information and documentation having been made available to the investigation. There may exist information that has not been made available that will supplement, change or contradict the interpretation of the facts presented here. All information, including technical information, extracts, exhibits and figures are based on information received during interviews, available documentation and supplemented with comments from the experts. Neither Kvamme Associates, Selmer or the experts can verify any of the information provided, nor vouch for the correctness or veracity of the information. Numerical values or information from documents or interviews that are cited and/or referred to, may contain transcription or other errors. The values and information in the original files prevail. It cannot be ruled out that there are technical or scientific justifications for the actions set out in the context of misconduct that the investigation has not identified. It cannot be ruled out that the actions set out in the context of misconduct were submitted, discussed or in any other way brought to the attention in some way or form to the customers; that the investigation has not identified. The investigation has not received all information requested from the customers. It is expected that they will contribute with more information and this may alter any facts, views and/or statements presented here.

No warranties or guarantees, expressed or implied, are included in or intended, except that it has been prepared in accordance with the Norwegian Bar Association guidelines for corporate investigations and generally accepted practices and standards on corporate investigations under Norwegian law.

All technical and legal assessments rely on the factual basis as described. Any changes, corrections and/or retractions may affect technical and legal assessments made in connection with this summary report.

The examination and methodology used, and the information has been examined only within the context of the mandate. There may exist other relevant information for the assessment of the issues that the investigation has not identified.

As part of the information provided to the investigation is received through interviews with individuals and third parties, the investigation does not represent nor guarantee that any such information referred, is correct, accurate, complete or non-misleading. The findings of the investigation are based on Norwegian law. No opinion is expressed as to the laws of any other jurisdiction.

From: Malgorzata Sneve <Malgorzata.Sneve@dsa.no>
Sent: Wednesday, May 13, 2020 9:43 AM
To: Watson, Bruce <Bruce.Watson@nrc.gov>
Cc: Kristin Elise Frogg <Kristin.Elise.Frogg@dsa.no>
Subject: [External_Sender] Halden

Dear Bruce,

I am contacting you on behalf of DSA since you have been involved in Halden from NRC and I hope you can assist us in providing this information to the right persons within NRC.

The issue is related to an investigation of irregularities and scientific dishonesty during some earlier scientific projects at the Halden reactor facility, performed for clients in the nuclear industry.

DSA has, since 2019 when we first were informed about possible dishonesty in the scientific work at the facility, followed the issue very closely and we have ordered IFE to investigate all possible consequences both at home and abroad. At an early stage we contacted the relevant nuclear safety authorities in the countries we then knew to be affected.

DSA has since then been continuously informed about how IFE's investigation has been conducted and what has been found. IFE has investigated whether the scientific work possibly had affected the safety at Norwegian nuclear facilities and how the manipulated scientific results might have been used in the nuclear sector in other countries.

The relevant projects goes back to 1997- 2003 and 2006-2015 and we understand might involve projects performed for (b)
(4) and for NRC.

As we understand it IFE will enlarge the investigation to include these new issues, and this implies that IFE will establish a dialogue with the customers based on a Non-Disclosure Agreement and a customer-specific fact finding report that will be issued to each customer in addition to a questionnaire to be developed by the technical experts supporting the investigation.

The first part of the investigation was finalized on April 20th and on the background of the findings in the report IFE has reported it to the Norwegian National Authority for Investigation and Prosecution of Economic and Environmental Crime (Økokrim).

We will do our own assessment of the conclusions in the report that have been drawn so far to ensure ourselves that the safety of the Halden reactor has not been jeopardized. It is important to clarify for how long the irregularities have been going on and the extent of them. We will therefore seek, in a dialogue with our sister authorities in other countries, to further investigate the use of the manipulated scientific results and their possible consequences. According to IFE the OECD Halden project is not affected. The OECD NEA is however informed of the investigation.

So this is to inform you and to ensure that we will seek cooperation and dialogue with ASN as the

relevant regulatory body. Do not hesitate to contact me if you have any questions.

See also a link on our website: <https://www.dsa.no/en/news/95178/dsa-will-follow-up-the-findings-from-the-investigation-of-irregularities-in-research-projects-at-the-halden-reactor>

Best regards

Malgorzata

Malgorzata K. Sneve
Director
Regulatory Cooperation Programme

Malgorzata.sneve@dsa.no

Dep. Nuclear Safety, Emergency and Environment
Telephone: +47 95 17 14 49



Telephone: +47 67 16 25 00

<http://www.dsa.no/>

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