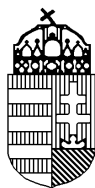


Hungarian Atomic Energy Authority



Guideline 4.7

Guideline 5.4.7

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Operational experience feedback

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PREAMBLE

The legal hierarchy of nuclear safety regulations in Hungary is as follows:

1. The uppermost level is represented by the Act CXVI of 1996 on Atomic Energy (Atomic Act).
2. The next level basically consists of two government decrees issued as executive orders of the Atomic Act. The 114/2003. (VII.29.) Korm. government decree defines the legal status of the Hungarian Atomic Energy Authority (HAEA), while the 89/2005. (V.5.) Korm. government decree specifies the HAEA's generic procedural rules in nuclear safety regulatory matters. The nuclear safety code consists of seven volumes, which are issued as the annexes of this latter decree. The first four volumes address the NPP, the fifth one the research and training reactors, whilst the sixth volume addresses the spent fuel interim storage facility. These six volumes determine the specific nuclear safety requirements, whilst the seventh volume contains the definitions applied in the code. The regulations are mandatory; failing to meet any of them is possible only in those specific cases that are identified by the decree.
3. The regulatory guidelines constituting the next level of the regulatory system are connected to one of the volumes of the code. The guidelines describe the method recommended by the proceeding authority for meeting the requirements of the nuclear safety code. The guidelines are issued by the director general of the HAEA, and they are regularly reviewed and reissued based on accumulated experience. So as to proceed smoothly and duly the authority encourages the licensees to take into account the recommendations of the guidelines to the extent possible.
4. In addition to the described regulations of general type, individual regulatory prescriptions and resolutions may also address specific components, activities and procedures.
5. The listed regulations are obviously supplemented by the regulating documents of other organizations participating in the use of nuclear energy (designers, manufacturers, etc.). Such documents are prepared and maintained in accordance with the internal quality assurance system of the user.

Before applying a given guideline, always make sure whether the newest, effective version is considered. The effective guidelines can be downloaded from the HAEA's website: <http://www.haea.gov.hu>.

Operational experience feedback

TABLE OF CONTENTS

1. INTRODUCTION	5
1.1. SUBJECT AND OBJECTIVE OF THE GUIDELINE	5
1.2. CORRESPONDING LAWS AND REGULATIONS.....	5
2. DEFINITIONS	7
2.1. ABBREVIATIONS	8
3. REGULATIONS FOR OPERATIONAL EXPEREINCE FEEDBACK .	9
3.1. GENERAL REGULATIONS WITH RESPECT TO OPERATIONAL EXPERIENCE.....	9
3.2. COLLECTION OF OPERATIONAL EXPERIENCE	9
3.2.1. Sources of external experience	10
3.2.2. Sources of internal experience	11
3.3. EVALUATION OF EVENTS	11
3.3.1. Assessment of events occurring in other facilities.....	11
3.3.2. Investigation of internal events.....	12
3.3.3. Analysis of event groups.....	13
3.4. CORRECTIVE MEASURES.....	14
3.5. CORRECTIVE ACTION PROGRAMME.....	15
3.5.1. Objective of the corrective action programme	15
3.5.2. Elements of the programme	15
3.5.3. Measuring the effectiveness	16
3.5.4. Evaluation of programme execution.....	16
3.6. ASPECTS FOR OPERATIONAL EXPERIENCE FEEDBACK	16

1. INTRODUCTION

1.1. Subject and objective of the guideline

The guideline contains recommendations of the HAEA on the implementation of regulations prescribed in Chapter 18.1 of NSC Volume 4 for nuclear power plants, in Chapter 5.19 of NSC Volume 5 for research reactors and in Chapter 5.18 of NSC Volume 6 for storage facilities of spent nuclear fuels.

The objective of the guideline is to provide recommendations to the licensee with respect to establishment and execution of processes aiming at the identification, collection and utilization of operational experience, and to further specify the regulatory requirements.

1.2. Corresponding laws and regulations

In accordance with the Nuclear Safety Code (NSC) issued based on the authorization of Article 4. § (1) of the Gov. decree 89/2005. (V.5.) Korm. on generic rules of procedures of the Hungarian Atomic Energy Authority in nuclear safety regulatory matters the licensee shall collect and utilize the operational experience

For nuclear power plants:

“The operating organization shall ensure the regular and continuous collection of characteristic data and experiences related to the operation of the nuclear power plant, the analysis and assessment of such data and the state of the nuclear power plant in order to maintain and increase the safety level of operation – even by the specification and implementation of corrective measures, if need be – and to ground decommissioning plans.” (NSC Volume 4 Article 18.001)

For research reactors:

“In the interest of maintaining and increasing operation safety level as well as providing basis for decommissioning plans, the operating organization shall ensure the continuous collection, analysis and evaluation of the experience concerning the operation of the research reactor.” (NSC Volume 5 Article 5.132)

Operational experience feedback

For storage of spent nuclear fuel:

“The operating organization has to ensure the systematic and continuous collection, analysis and evaluation of experiences related to the operation of the storage facility in order to maintain and improve the safety level of operation.” (NSC Volume 6 Article 5.145)

2. DEFINITIONS

This chapter does not include the definitions that are already described in the NSC volumes.

Human failure:

A failure that is caused by deviation between a required and a realized action, because the concerned person(s) do(es) not execute the required action, do(es) not properly (with delay, in false sequence or inappropriately) execute the action or perform inappropriate (not permitted, forbidden or false) action, as a result of which disturbance or non-compliance occurs.

Contributing cause:

That cause or those causes, which contribute(s) to the occurrence, but which is (are) not able to realize or result in the occurrence of an event individually.

Corrective measure:

Action specified with the aim of elimination of a causal factor or a cause of an event.

Direct (initiating) cause:

A cause or circumstance, which directly results in a deviation between a required and an actual action or situation, or which directly results in the occurrence of an event.

Causal factor:

Any situation, circumstance or occurrence resulting or not resulting in an event entailing adverse safety, health, quality assurance, security or operating effect, which individually or together with other factors has effect on the process (contribute to or induce the occurrence of an event).

Latent failure:

Not recognized organizational, documentation or equipment failure, which cannot be revealed by the applied inspection procedures and which may result in an event.

Operational experience:

Deviations, events occurring and identified during the lifetime of a nuclear facility and the knowledge originating from their analysis, the appropriate

Operational experience feedback

feedback of which can contribute to the improvement of safety of the nuclear facility.

Near-miss:

Such a situation, which has not resulted in an event yet, but means negative deviation from a required state and increases the safety risk.

2.1. Abbreviations

NSC Nuclear Safety Code

3. REGULATIONS FOR OPERATIONAL EXPERIENCE FEEDBACK

3.1. General regulations with respect to operational experience

The NSC provides the following regulation for utilization of operational experience:

The operating organization shall ensure the regular and continuous collection of characteristic data and experiences related to the operation of the nuclear power plant, the analysis and assessment of such data and the state of the nuclear power plant in order to maintain and increase the safety level of operation – even by the specification and implementation of corrective measures, if need be – and to ground decommissioning plans.

“During the analysis and assessment of operating experience, a high importance shall be attached to the investigation and inspection of any disorders, incidents and any events affecting safety occurring during operation (also including maintenance, repair, inspection and review), and to the identification of their causes, implications and the gravity of their possible consequences, as well as to specifying measures to be taken to prevent similar disorders from happening.” (NSC Volume 4 Article 18.002; NSC Volume 5 Article 5.133; NSC Volume 6 Article 5.146)

„ The operating organization shall prescribe requirements for the content, the scope and methods of collecting, analyzing and documenting operational data and experiences in a written and appropriately approved procedure.” (NSC Volume 4 Article 18.012; NSC Volume 5 Article 5.138; NSC Volume 6 Article 5.149)

3.2. Collection of operational experience

The collection of operational experience is aimed to preserve and make available (also even for other nuclear facilities) the lessons learned from operating events deviating from normal service conditions, and thus to provide their throughout evaluation.

The collection of operational experience is ensured by the establishment and operation of such a database, which makes possible the as far as possible utilization of the lessons learned from daily practice. Its objective is to support effective measures (with respect to the safety significance of events)

Operational experience feedback

to prevent the repeated occurrence of events. An important aspect during the development of the database is to provide the information necessary to understand the occurrences, the relevant conclusions of the analyses, the causes of events and the corrective measures implemented to eliminate the causes.

The identification, registration and utilization of safety relevant circumstances should be ensured by drawing and collection of operational experience and operation (maintenance of its up-to-date status, appropriate access and search possibilities) of the database.

The events and experience originating from external sources should be prioritized with respect to their safety effects, what should ensure that their analysis is made with respect to their safety significance. The prioritization should be made by persons possessing throughout operational experience in accordance with criteria specified in advance; since an important contributing cause of events is the human failure, therefore beyond the engineering practice these persons should have knowledge of judging events resulted by human failures as well.

3.2.1. Sources of external experience

The licensee should regularly collect and assess the operational experience of other facilities and organizations; measures should be taken for their utilization. The assessment should be made in such a way, which ensures that the lessons learned from sources outside of the facility are timely built into the service practice:

Experience gained in domestic and foreign missions and forums should be available for all interested persons of the organization. The suggestions should be built into the system, which realize, by taking account of the corresponding regulations, the beneficial modifications induced by the suggestions.

Information provided through membership in national and international organizations. It should be processed in such a way, which ensures the development of the necessary corrective measures by the licensee.

Another source of external experience is in relation with the international organizations having expertise in collection and evaluation of events and in information exchange. The information originating from such sources should have special role in prevention of similar events and undesirable

Operational experience feedback

occurrences. The experience from external sources should be also utilized during the investigation of non-planned events occurring in nuclear facilities.

Other sources of external experience are the results of domestic and international research and development projects. The implementation of corrective measures originating from their analysis can efficiently enhance the safety level of operation.

3.2.2. Sources of internal experience

The licensee should continuously identify and collect deviations, operating and maintenance events and deviations during the whole lifetime (establishment, commissioning, service, decommissioning) of the nuclear facility. This activity should cover the events falling under eventual reporting obligation as specified in the NSC and those deviations, which result or may result in actual or potential damage to the defense in depth (e.g. near misses).

The sources of information are:

quality management system,

operative access to organizational forms keeping the safety as first priority (safety management system),

assessment of information originating from management reviews,

experience from the assessment of external relation system,

evaluation of internal operating processes,

experience from condition monitoring, maintenance and operation of systems, structures and components.

3.3. Evaluation of events

3.3.1. Assessment of events occurring in other facilities

The utilization of experience originating from external sources should be made by the application of specified assessment procedures. The review of events, event reports and evaluations should aim at maximizing the internal utilization. Accordingly, criteria specified in advance facilitate the screening and collection of experience from external sources. The evaluation is aimed to implement such measures by utilizing the experience from event occurred

Operational experience feedback

in other facilities, which can avoid and prevent the occurrence of similar events in the domestic facility.

The input information should be stored in an organized way e.g. in a database, which includes the results (summary) of accomplished analyses, the result of comparison of external experience with applied practice, the viewpoints considered during the assessment of potential utilization, and the recommended and implemented measures; this provides the feedback possibility for the future (e.g. periodic reviews and investigations).

3.3.2. *Investigation of internal events*

The objective of investigating the internal events with respect to their safety significance is to reveal as far as possible the causes and circumstances leading to events, in order to avoid the repeated occurrence of similar events by implementation of corrective measures aiming at eliminating the causes.

The licensee should conduct event investigation on different levels with respect to the safety significance of events in order to identify the causes of occurrences.

The investigation activity should be started as soon as possible subsequent to the event. At first the personnel should be interviewed in order to collect the information and proofs (e.g. archives and data of registers). The event investigation should include the reconstruction of the event scenario. This should include both the technological occurrences and the human actions. Additionally, the investigation should cover the assessment of the harmony of oral and written instructions, human actions and technological occurrences.

The investigation should include the assessment of technological failures, inappropriate actuations, processes resulting in them, circumstances and of adequacy and completeness of oral and written instructions, organizational and management forms and human actions. The non-compliances also include the flaws of the quality management system. The investigator should identify the causes of these deviations. With respect to the significance of an event the investigation should be conducted in such depth, which makes possible to identify the causes contributing to the occurrence of the event, and especially at first its root cause.

Specified and well-tried techniques and procedures should be applied to identify the causes and especially the root cause of an event. The

Operational experience feedback

investigation procedure (including the above mentioned techniques) should be continuously developed by the licensee.

The identification of causes of an event is supported by the assessment of the effectiveness of the various levels of defense. The investigation should cover the following areas as minimum:

physical environment (proper work conditions, human-machine interface),
equipment (adequate design, structural and other materials, effectiveness of preventive maintenance, maintenance and quality control, equipment conditions: ageing, known but not managed problems, etc.),
human factor (whether a human failure leads to the event: mistake *unintentional false handling*, inattention of details, inattention of a procedure or an instruction, incorrect tool selection, etc.; physical and mental conditions of personnel, stress, overloading, tiring, time pressure. Adequacy of training, qualification, communication),
organization and management (adequacy of control: management expectations, procedures, instructions, effectiveness of management reviews. Decision making, lack of resources, distribution of responsibility, risk management, adequacy of preparation for and organization, management and control of works).

The root cause of an event should be identified on the basis of identification of event causes and damaged defense levels.

Beyond the happened failures and occurrences the analysis and evaluation of safety effects of an event should cover the future development of the event, in order to properly judge the safety significance of an event. The corrective measures to be implemented should be developed on the basis of the evaluation of the safety significance of an event.

3.3.3. *Analysis of event groups*

In addition to the event investigations the group review of events on the basis of certain attributes provides useful information. The selected attribute should provide a link (common cause, identical or similar equipment, identical circumstances, etc.) between the events that are similar from a certain point of view. The objective of analysis of event-groups is to identify such latent failures and tendencies which were not revealed or were revealed without respect to their significance during the event investigations. The application of such analyses is efficient, if they are conducted regularly

Operational experience feedback

(once a year). Based on analysis results such latent problems can be identified, which can be eliminated by adequate corrective measures.

3.4. Corrective measures

An investigation achieves its objective if it successfully identifies the causes and circumstances leading to the event, and develops measures with respect to the safety significance of the event, which can eliminate as far as possible these causes and circumstances entailing negative effects.

The foreign experience should also be utilized by developing and implementing appropriate corrective actions.

The root cause(s) of an event has(ve) primary role during the development of corrective measures, since the elimination of these deviations can prevent the reoccurrence of this event.

An important aspect during the development of corrective measures is that the corrective measures should be well justified, unambiguous, understandable for their executors and realizable in practice. The licensee should assess the potential adverse effects of equipment modifications and modifications of operational documents. The assessment should be made in a depth being in harmony with the potential safety effect of the planned corrective actions.

The effectiveness of corrective measures should be verified; they should be implemented in time. If necessary the implementation of temporary measures may be reasonable.

The timely implementation of corrective measures should be guaranteed by the specification of deadlines and responsible persons for each action. The effectiveness and keeping the deadline are the primary viewpoints during regular evaluation of the implementation of corrective actions and their results.

Those engineering solutions should get priority during the selection of corrective measures, which can reliably and totally eliminate the causes. Administrative measures could be reasonable, but their effectiveness is low. The building of lessons learned into the training programme is essential, but the training by itself is not an effective corrective action.

The investigation should reveal the repetitive nature of events. An event is repeated, if a new event occurs, because the experience learned from a previous event was not or not comprehensively utilized.

Operational experience feedback

If the repetitive nature is revealed, then the evaluation of corrective measures that are specified in relation with the previous event is supported provided that the evaluation is made by assessing the following issues:

Were the corrective measures totally implemented within the specified deadline?

Were the implemented corrective measures effective? Were they applicable for eliminating the cause?

Was the cause properly identified during the previous event?

Was the period of time between the occurrences of the two events sufficient for implementing the decided measure(s)?

Is it necessary to intervene into the investigation process based on the identified cause?

The verification of corrective measures is a process to be regularly repeated; it supports to judge the effectiveness of measures and provides the neglecting of those types of corrective measures that are not sufficiently effective.

3.5. Corrective action programme

3.5.1. Objective of the corrective action programme

In order to comprehensively utilize the operational experience its control should be organized by development and operation of a corrective action programme.

The objective of the programme is to support the effective realization of corrective measures, to follow-up their implementation, to continuously evaluate their results and to reveal their potential adverse effects. In the frame of the programme the adequacy of procedures aiming at operational experience feedback should be regularly verified and evaluated, the effectiveness of procedures should be reviewed; accordingly the weak points can be identified and the procedures can be continuously improved.

3.5.2. Elements of the programme

follow-up on the status of implementation of measures,

follow-up and recording of deadlines of tasks and subtasks,

Operational experience feedback

elaboration of reports and regular evaluations, which monitor the status of the implementation of corrective measures, including evaluation of the executed measures and their effectiveness (together with lessons learned from reoccurring events), measures in delay, its reasons, suggestions regarding their elimination and if appropriate the modified measures,

development of additional measures, if appropriate,

management support (The support and control provided by the management significantly contribute to the effective execution of the programme).

3.5.3. *Measuring the effectiveness*

The performance indicators developed in this field may facilitate the judgment on the effectiveness of the process.

Indicators may relate to the evaluation of the effectiveness of investigations (e.g. number of reoccurring events) and the measurement of execution of corrective actions (ratio and number of actions in delay, number of their modifications, etc.).

3.5.4. *Evaluation of programme execution*

The licensee should regularly evaluate the execution of the corrective action programme. The evaluation should cover the performance indicators, the deviations and deficiencies identified in the process, the weak points and the measures developed for their elimination, the status and results of previously specified actions.

In the regular reports the licensee should describe its activities in the field of operational experience feedback. It should describe the external and internal events and other sources falling under the scope of analyses, the decided corrective actions and their status.

3.6. Aspects for operational experience feedback

The following aspects can support the licensee in effective organization of the process of operational experience feedback:

The experience gained from events occurred in similar units, the lessons learned from events induced by human and organizational failures, and the lessons learned from events entailing significant safety risk should get priority in the screening system used for evaluation of external event and experience.

Operational experience feedback

The licensee should prevent the occurrence of abnormal service states through the investigation of internal events. Consequently, it should identify the deviations, events, circumstances that can potentially lead to events and serious situations, and involve them into the process of operational experience feedback.

In addition to ensure the priority of safety in the decisions on corrective measures, the licensee should strive for developing such corrective measures that are effective and executable within optimum time period from safety viewpoint in order to achieve long term economic operation.

The licensee should guarantee the priority of safety during the prioritization of corrective measures.

The licensee, at first should strive for eliminating the root causes of event.

In order to ensure the execution of corrective measures the licensee should introduce a corrective action programme for enhancing effectiveness.