



Authority for Nuclear Safety and
Radiation Protection

Report on events in Dutch nuclear facilities during 2018

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Summary

In fulfilment of the responsibilities of the ANVS, as defined at the time of its establishment on 1 August 2017, this report summarizes the events that occurred in 2018 at Dutch nuclear facilities licensed under Section 15 (b) of the Nuclear Energy Act, which were subject to a notification requirement. Notification criteria are defined for each individual nuclear facility, specifying the events that have to be notified to the ANVS and the periods within which notification must take place. The ANVS also undertakes periodic inspections to assess licensees' supervision of internally recorded events. The purpose of such inspections is to verify that events are correctly resolved, that the licensee learns from events and that all compulsory notification events are indeed notified to the ANVS.

The ANVS publishes details of notified events on its website¹ as soon as sufficient information about the event is available to enable proper description. The ANVS seeks to provide a clear, up-to-date summary of all notified events on its website. It has therefore been decided that, with effect from this year, the ANVS's annual event reports will no longer contain full details of each event and its resolution. Instead, reference is provided to the website, where such details are available.

In 2018, the licensees of the various nuclear facilities notified the ANVS of a total of fourteen events. All the events were provisionally classified as minor anomalies with no safety repercussions, INES level 0. Nevertheless, the ANVS instigated investigations into two events, on account of their impact on the facility. The aim of the investigations is to establish what safety-related lessons can be learnt from the events.

The events in question involved, respectively, the automatic shutdown of the Borssele Nuclear Power Plant in response to a fault in the reactor safety system on 4 August, and an instance of soil pollution caused by a leak in a pipeline in the primary pumping room at the High Flux Reactor on 25 October.

In 2018, inspections of the facilities' internal event records for 2017 revealed that the ANVS had not been notified of one event that in hindsight was subject to a notification requirement. Three events that were notified to the ANVS in 2017 were subsequently deemed not to be subject to a notification requirement. Those observations and a revision to the overview published last year are included in this report as updates to the event report for 2017.

On the basis of the information provided in licensee notifications and obtained on-site inspections, ANVS concludes that, in general, the licensees of the nuclear facilities tackled the events which occurred at their facilities in 2018 with due care. Nevertheless, the prompt and thorough investigation of events continues to require attention, the ANVS believes. The ANVS considers that the licensees actively analysed events occurring at their facilities and made active use of event analysis findings, with a view to realizing improvements. The ANVS regards the event notifications received in 2018 as confirming the importance of ensuring that its supervisory activities continue to focus on the following: management of aging processes, knowledge of facilities, management of maintenance activities and management of change processes.

¹ See www.ongewonegebeurtenissen.nl.

1 Introduction

As at any industrial plant, events occur at nuclear facilities which influence or have the potential to influence operational safety. The licensees of nuclear facilities in the Netherlands are required to record all events that could influence safety. They record the events in an internal database, where they must note details such as what measures were taken in line with analysis of each recorded event. The events recorded in the internal databases range from potentially unsafe situations to events that must be notified to the ANVS. This report summarizes the compulsory notification events that occurred at Dutch nuclear facilities in 2018. The ANVS performs random inspections of licensees' event databases to verify that licensees are learning from events and that all events judged by the ANVS to be compulsory notification are indeed notified to the ANVS.

The ANVS's event reporting activities stem from an undertaking made by the then Minister of Social Affairs on 27 February 1980, to inform the House of Representatives about the functioning of Dutch nuclear power plants, in writing, annually. When the ANVS was established on 1 August 2017, it was determined that the ANVS would submit annual event reports to the House of Representatives. This report has been prepared in fulfilment of that responsibility.

1.1 Events at nuclear facilities in the Netherlands

The conditions of a Nuclear Energy Act licence require that the ANVS is notified of any abnormal event. Notification criteria are defined for each individual nuclear facility, specifying the events that have to be notified to the ANVS and the periods within which notification must take place. The length of the period allowed for notification depends on the nature of the event; in some cases, immediate notification is required, while in others notification must take place within a period of up to four weeks. With a view to aligning the various facilities' notification criteria more closely, the ANVS is developing Notification Criteria Guidelines for Nuclear Facilities. The Guidelines are intended to help the licensees of nuclear facilities decide what must be notified to the ANVS, how and within what time frame.

Following an initial notification to the ANVS, a licensee is required to investigate the precise nature and circumstances of the event. In that context, consideration must be given to the lessons that can be learned and to the scope for making improvements to prevent recurrence. That is the responsibility of the licensee of the nuclear facility in question. Such post-event analysis contributes to the continuous improvement of safety at nuclear facilities. The ANVS oversees the licensees' event investigations and implementation of the associated learning points and improvements.

The ANVS publishes details of notified events on its website once sufficient information about the event is available to enable proper description. Each event that is the subject of a notification published on the ANVS website is given an INES rating. INES stands for 'International Nuclear and Radiological Event Scale': a measure of the severity of an event, for use in communications. More information about INES is provided in Annex A to this report. Where certain events are concerned, the ANVS releases information immediately: details of events with consequences for the living environment, safety-relevant events and events that may give rise to questions or cause concern among local residents or the general public are published on the homepage of the ANVS website immediately.

The INES ratings for some events referred to in this report may be revised once their investigation or the associated assessment has been concluded. In practice, however, it is unusual for ratings to be revised on the basis of subsequent investigations. The ANVS also undertakes periodic inspections to assess licensees' supervision of internally recorded events. The purpose of such inspections is to verify that events are correctly resolved, that the licensee learns from events and that all compulsory notification events are indeed notified to the ANVS.

If an inspection yields new information that warrants re-evaluation of an event, the information on the ANVS website is revised and an update is provided in the next annual event report. Hence, this report includes updates to the annual event report for 2017.

This report includes the notifications submitted by the following holders of licenses issued pursuant to Section 15 under b of the Nuclear Energy Act:

- Electricity Production Company South-Netherlands (EPZ), licensee of the Borssele Nuclear Power Plant (KCB) at Borssele
- Nuclear Research and Consultancy Group (NRG) of Petten, licensee of the following facilities:
 - High Flux Reactor (HFR)
 - other NRG facilities²
- Central Organisation for Radioactive Waste (COVRA) of Nieuwdorp
- Delft University of Technology, of Delft, licensee of the Higher Education Reactor (HOR), the DELPHI sub-critical ensemble and laboratories at the Reactor Institute Delft (RID)
- URENCO Nederland, licensee of the uranium enrichment plants at Almelo
- Joint Nuclear Power Plant Nederland (GKN), of Dodewaard, licensee of the Dodewaard Nuclear Power Plant (KCD), which was definitively shut down in March 1997 and is currently in a state of safe enclosure

1.2 Events at nuclear facilities in other countries

In line with international agreements on responsibility for nuclear safety, the information about events at facilities in other countries published on the ANVS website is normally restricted to references to communications by the competent authorities in the countries in question. For details of the competent authorities in other countries and links to their information pages, see <https://www.autoriteitnvs.nl/nucleaire-crisis-of-stralingsongeval/nucleaire-veiligheid-in-onze-buurlanden>. The ANVS additionally informs the public actively about events that are relevant for nuclear safety or radiation protection and events at nuclear facilities in Belgium and regions of Germany that border the Netherlands that are similarly relevant from a communications viewpoint. Where necessary, Twitter is used to draw events to public attention.

² The Low Flux Reactor (LFR), the Hot Cell Laboratories (HCL) comprising the Research Laboratory (RL) and the Molybdenum Production Facility (MPF), the Decontamination and Waste Treatment Facility (DWT) and the Waste Storage Facility (WSF).

2 Overview of events in 2018

This chapter summarizes the events at Dutch nuclear facilities in 2018, concerning which the ANVS was notified by the holders of licences issued pursuant to Section 15 under b of the Nuclear Energy Act. The notified events included in the summary are events notified to the ANVS on the basis of the defined notification criteria. Table 1 shows the number of compulsory notification events at each facility, categorized according to INES level.

Table 1 The total number of compulsory notification events at each company in 2018, categorized according to INES level.

Facility	Compulsory notification events in 2018	Consisting of:		
		INES level 0	INES level 1	INES level >1
Borssele Nuclear Power Plant (KCB), Borssele	7	7	0	0
High Flux Reactor (HFR), Petten	1	1	0	0
Other NRG facilities, Petten	4	4	0	0
Central Organisation for Radioactive Waste (COVRA), Nieuwdorp	0	0	0	0
Higher Education Reactor (HOR), Delft	1	1	0	0
URENCO Nederland, Almelo	1	1	0	0
Dodewaard Nuclear Power Plant (KCD), Dodewaard	0	0	0	0
Total for all nuclear facilities	14	14	0	0

All events notified to the ANVS in 2018 were rated as INES-0. An event's rating is liable to be increased to INES-1 if investigation reveals that the event could have had more severe consequences, that a systematic safety culture problem exists or that the licensee has failed to learn properly from previous events.

The events that occurred at each nuclear facility are summarized in the following subsections. Details of each event are available on the ANVS website. The ANVS seeks to provide a clear, up-to-date summary of all notified events on its website. The event details on the website are updated whenever relevant new information becomes available, at the conclusion of an investigation, for example. It has therefore been decided that, with effect from this year, the ANVS's annual event reports will no longer contain full details of each event and its resolution. For up-to-date descriptions of the events referred to below, see the ANVS website: www.ongewonegebeurtenissen.nl.

2.1 Borssele Nuclear Power Plant (KCB), Borssele

In 2018, Electricity Production Company South-Netherlands (EPZ), the licensee of the Borssele Nuclear Power Plant, notified the ANVS of seven events.

- 24 January 2018: Maximum storage period of packaged radioactive waste exceeded (INES level 0)
- 19 February 2018: Brief interruption of external power supply to part of the emergency power network due to damage to underground cable during excavation work (INES level 0)
- 1 March 2018: Monitoring system briefly unavailable (INES level 0)
- 10 June 2018: Automatic shutdown of the reactor during restart following annual maintenance (INES level 0)

- 4 August 2018: Automatic shutdown of the reactor due to reactor safety system malfunction (INES level 0)
- 25 October 2018: Brief power supply interruption in the 10kV external grid due to testing activities (INES level 0)
- 20 November 2018: Brief power supply interruption due to external network switch fault (INES level 0)

2.2 High Flux Reactor (HFR), Petten

In 2018, Nuclear Research and Consultancy Group (NRG), the licensee of the High Flux Reactor, notified the ANVS of one event.

- 25 October 2018: Soil pollution resulting from leak in pump building pipeline (INES level 0)

2.3 Other NRG facilities³, Petten

In 2018, NRG notified the ANVS of four events at its other facilities.

2.3.1 Molybdenum Production Facility (MPF)

- 31 January 2018: Evacuation of transport area in response to iodine alarm (INES level 0)

2.3.2 Hot Cell Laboratories (HCL)

- 9 February 2018: Evacuation of Hot Cell Laboratories in response to negative pressure alarm (INES level 0)
- 2 August 2018: Radiation meters not calibrated on schedule (INES level 0)
- 24 September 2018: Unintended opening of Hot Cell lock gate (INES level 0)

2.4 Central Organisation for Radioactive Waste (COVRA), Nieuwdorp

In 2018, COVRA did not notify the ANVS of any events.

2.5 Higher Education Reactor (HOR), Delft

In 2018, Delft University of Technology, the licensee of the Higher Education Reactor, notified the ANVS of one event.

- 15 February 2018: Precautionary shutdown of reactor due to reduction of safety margin (INES level 0)

2.6 URENCO Nederland, Almelo

In 2018, URENCO notified the ANVS of one event.

- 20 November 2018: Required check not performed before transfer of waste water to transporter tank (INES level 0)

2.7 Dodewaard Nuclear Power Plant (KCD), Dodewaard

GKN, the licensee of the Dodewaard Nuclear Power Plant, did not notify the ANVS of any events in 2018.

³ 'Other facilities for which NRG has a licence' means the Hot Cell Laboratories (HCL), comprising the Research Laboratory (RL) and the Molybdenum Production Facility (MPF), the Low Flux Reactor (LFR), the Waste Storage Facility (WSF), the Decontamination and Waste Treatment (DWT) and other laboratories, including the Jaap Goedkoop Laboratory (JGL).

3 Updated overview of events in 2017

After the publication of an annual report, new results, findings or insights may become available, such that the published overview of events no longer constitutes a complete and accurate picture of actual events. Sometimes, for example, the INES rating ascribed to one or more events detailed in an annual report, or the number of compulsory notification events stated as having occurred, has to be revised in line with the conclusions of investigations still in progress at the time of publication, subsequent site inspections or reassessment by the ANVS. This chapter describes the revisions made since the last annual report. The ANVS endeavours to ensure an up-to-date list of events is always available on its website.

3.1 Completeness of licensees' notification activities

Updates to the information regarding each facility presented in the event report for 2017 are provided below.

3.1.1 Borssele Nuclear Power Plant (KCB), Borssele

An inspection of KCB's internal event records for 2017 carried out in 2018 revealed no compulsory notification events that had not been notified to the ANVS.

3.1.2 High Flux Reactor (HFR), Petten

An inspection of HFR's internal event records for 2017 carried out in 2018 revealed no compulsory notification events that had not been notified to the ANVS.

3.1.3 Other NRG facilities, Petten

In 2018, an inspection of NRG's internal event records for its other facilities in 2017 revealed one compulsory notification event that had not been notified to the ANVS.

The event involved failure to calibrate a number of gamma radiation meters in good time. A similar event occurred in 2018; see the notification of 2 August 2018 cited in subsection 2.3 of this report. Because the two events were linked, the ANVS decided to consider their resolution and investigation on a combined basis and not to require a separate notification. Communication regarding the two events was similarly combined under the heading of the 2018 notification. However, in the context of the overview of compulsory notification events, the 2017 event has been treated as an event in its own right.

In the case of three events notified to the ANVS in 2017, the sole notification criterion was mobilization of the company emergency service; notification was not necessary for reasons of nuclear safety or radiation protection. In light of the notifications, the criterion in question was reviewed in 2018. It was concluded that mobilization of NRG's company emergency service did not always constitute a mobilization based on the risk associated with an event or its consequences. NRG sometimes uses its company emergency service to facilitate efficient internal communication regarding a situation or the resolution of events that are not relevant to safety. The ANVS has accordingly decided that, if the sole criterion for notification of an event is mobilization of the company emergency service, the event should be deemed discretionary notification events, not compulsory notification events. Three events can therefore be removed from the 2017 overview of compulsory notification events:

- 21 March 2017: NRG/DWT - Evacuation of Decontamination and Waste Treatment facility (DWT) in response to suspected natural gas smell
- 22 August 2017: NRG/other - Mobilization of NRG emergency service following fall of a staff member
- 2 October 2017: NRG/Other - Mobilization of emergency service in response to release of harmful vapours following overheating of local emergency power supply

3.1.4 Central Organisation for Radioactive Waste (COVRA), Nieuwdorp

COVRA's written quarterly statements describe the internally recorded events. Routine inspections at which the reports were discussed revealed no compulsory notification events that occurred in 2017 but that had not been notified to the ANVS.

3.1.5 Higher Education Reactor (HOR), Delft

Delft University of Technology's written quarterly statements describe the internally recorded events at HOR. Routine inspections at which the reports were discussed revealed no compulsory notification events that occurred in 2017 but that had not been notified to the ANVS.

3.1.6 URENCO Nederland, Almelo

URENCO's written six-monthly statements describe the internally recorded events. Routine inspections at which the reports were discussed revealed no compulsory notification events that occurred in 2017 but that had not been notified to the ANVS.

3.1.7 Dodewaard Nuclear Power Plant (KCD), Dodewaard

Because the Joint Nuclear Power Plant Nederland (GKN) in Dodewaard was definitively shut down in March 1997 and is 'in safe enclosure', there is no routine inspection of internal event records. The written quarterly reports in which relevant system and component anomalies are described were not found to refer to any compulsory notification events that occurred in 2017 but that had not been notified to the ANVS.

3.2 Updates to preliminary INES ratings

In 2018, the investigations into numerous events notified in 2017 and previous years were concluded and considered by the ANVS.

Following consideration of the final investigation report on an event, a final INES rating is assigned. None of the investigation reports considered provided grounds for revision of the previously assigned (preliminary) INES ratings.

3.3 Updated overview of events in 2017

The overview of events in 2017, updated to reflect the re-evaluations described in 3.1, is presented in Table 2.

Table 2 Revised total number of compulsory notification events at each company in 2017, categorized according to INES level.

Facility	Compulsory notification events in 2017		Consisting of:		
	Previously reported	Revised	INES level 0	INES level 1	INES level >1
Borssele Nuclear Power Plant (KCB), Borssele	4	4	4	0	0
High Flux Reactor (HFR), Petten	1	1	1	0	0
Other NRG facilities, Petten	13	11	11	0	0
Central Organisation for Radioactive Waste (COVRA), Nieuwdorp	0	0	0	0	0
Higher Education Reactor (HOR), Delft	2	2	2	0	0
URENCO Nederland, Almelo	1	1	1	0	0
Dodewaard Nuclear Power Plant (KCD), Dodewaard	0	0	0	0	0
Total for all nuclear facilities	21	19	19	0	0

4 Evaluation

Licensees' event notifications and information about other events at the facilities provides the ANVS with insight into the following:

- How are licensees dealing with events?
- How do licensees apply the principle of continuous improvement? (How do licensees learn from events?)
- How are licensees implementing response measures following events?

In this chapter, the ANVS considers the questions above in relation to each facility and addresses some event reporting trends in the period 2009 to 2018, inclusive.

4.1 Individual facility evaluations

The quality of the event resolution activities at each facility is described below, both generally and in relation to the main events. For more information about all events, visit www.ongewonegebeurtenissen.nl.

4.1.1 Borssele Nuclear Power Plant (KCB), Borssele

EPZ notified the ANVS of seven events in 2018, all of which were rated INES level 0. All the event notifications were made in good time and were of an appropriate quality. EPZ also demonstrated a willingness to learn from the events with a view to minimizing the chance of recurrence. Furthermore, EPZ responded appropriately to the ANVS's follow-up questions regarding the events and EPZ's investigations.

The ANVS is conducting its own investigation into the underlying causes of the automatic shutdown in response to a reactor safety system fault (4 August 2018), in addition to the investigation undertaken by EPZ. The purpose of the ANVS investigation is to provide a picture of the process and background factors relevant to the event, so that the ANVS may independently determine what safety lessons may be learnt. The results of the two investigations will be discussed together.

4.1.2 High Flux Reactor (HFR), Petten

NRG notified the ANVS of one event at the High Flux Reactor in 2018. During an inspection, the ANVS established that the resolution of notifiable events and other internally recorded events at HFR was satisfactory in terms of quality, depth and time scale. During an inspection where the maintenance registration system was also examined, the ANVS observed that relevant maintenance notifications were not always consistently recorded or treated as events or incidents. As a result, such notifications did not necessarily contribute to the process of continuous learning. NRG is taking measures to address that situation.

The only compulsory notification event in 2018 involved the leakage of radioactive primary water into the soil as a consequence of repairs to a water treatment installation (see above). Although the consequences were minor, the ANVS takes a serious view of the event and is therefore conducting its own investigation into the underlying causes, in addition to the NRG investigation. In view of the minor nature of its direct consequences, this event has been rated as INES-0.

4.1.3 Other NRG facilities, Petten

NRG notified the ANVS of four events at its other facilities in 2018. All the event notifications were made within the required time periods. None of the events qualified for a rating of INES-1 or higher. NRG has acted upon the agreement concluded with the ANVS in 2017 regarding the improvement of NRG's event notification activities by optimizing the process of compulsory notification event resolution. The ANVS notes that the quality of the event resolution at NRG has improved significantly. NRG has also taken action to ensure that event resolution and the associated communication are undertaken promptly. The ANVS nevertheless expects NRG to continue to address this issue with a view to realizing further improvements.

4.1.4 Central Organisation for Radioactive Waste (COVRA), Nieuwdorp

In 2018, COVRA did not notify the ANVS of any events. On the basis of the quarterly reports and the findings of operational inspections, the ANVS considers that COVRA's event registration and continuous improvement activities are satisfactory.

4.1.5 Higher Education Reactor (HOR), Delft

Delft University of Technology notified the ANVS of one event in 2018. Event notification and resolution were within the required time frames. On the basis of the university's resolution of the event, the quarterly reports and the findings of operational inspections, the ANVS considers that Delft University of Technology's event registration and continuous improvement activities are satisfactory.

4.1.6 URENCO Nederland, Almelo

URENCO notified the ANVS of one event in 2018. The notification was made promptly and URENCO is currently investigating the event. In response to the event, an ANVS inspection in 2019 will look at URENCO's management of the uranium mass flows in the various processes with a view to building a fuller picture. On the basis of URENCO's resolution of the event, the biannual reports and the findings of operational inspections, the ANVS considers that URENCO's event registration and continuous improvement activities are satisfactory.

4.1.7 Dodewaard Nuclear Power Plant (KCD), Dodewaard

In 2018, GKN did not notify the ANVS of any events. From a discussion of one recorded event at the facility that did not require notification, the ANVS concluded that GKN's event resolution and continuous improvement activities were satisfactory.

4.2 Notification trends 2009 to 2018

In order to provide the public with information about event severity, the ANVS rates events on the INES scale; see Annex A. However, most of the events that occur in the Netherlands are 'below scale', i.e. rated as INES-0: a minor anomaly with no safety repercussions. The occurrence of such events is illustrated in Figure 1.

INES-0 events are difficult to compare, partly because the number of notifications depends on the notification criteria, and partly because the practice in many countries is to restrict notification to events rated as INES-1 and higher. Figure 2 shows events rated as INES-1 and higher occurring at the various facilities in the Netherlands since 2009.

Figure 1: All compulsory notification events at Dutch nuclear facilities, 2009 to 2018 inclusive.⁴

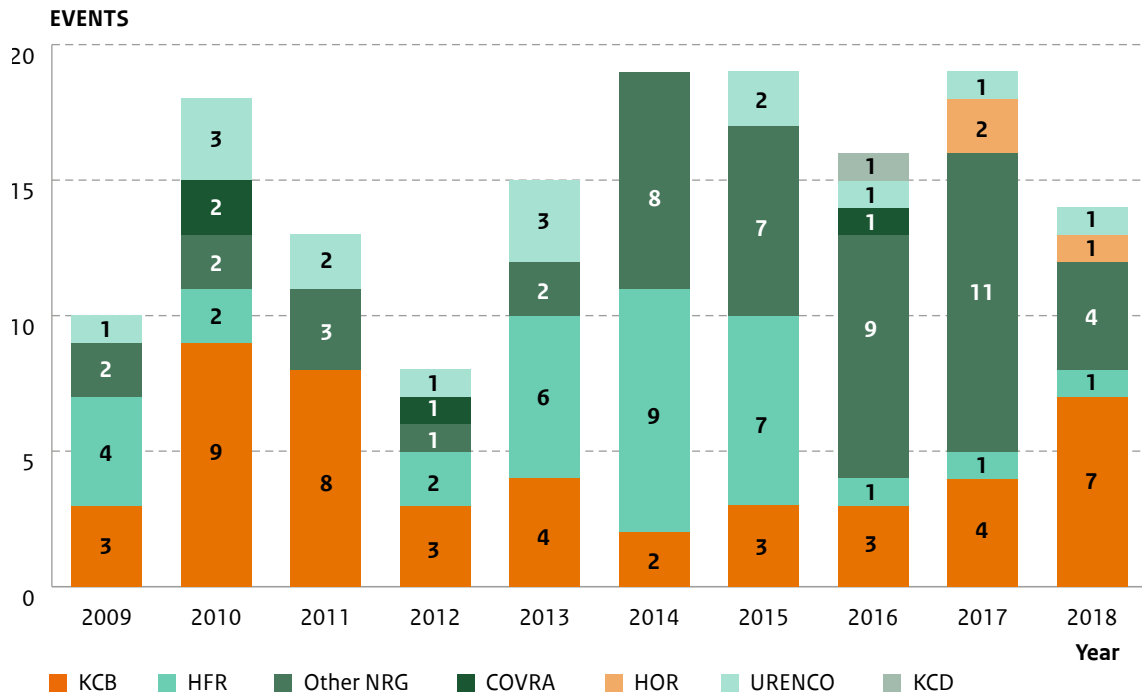
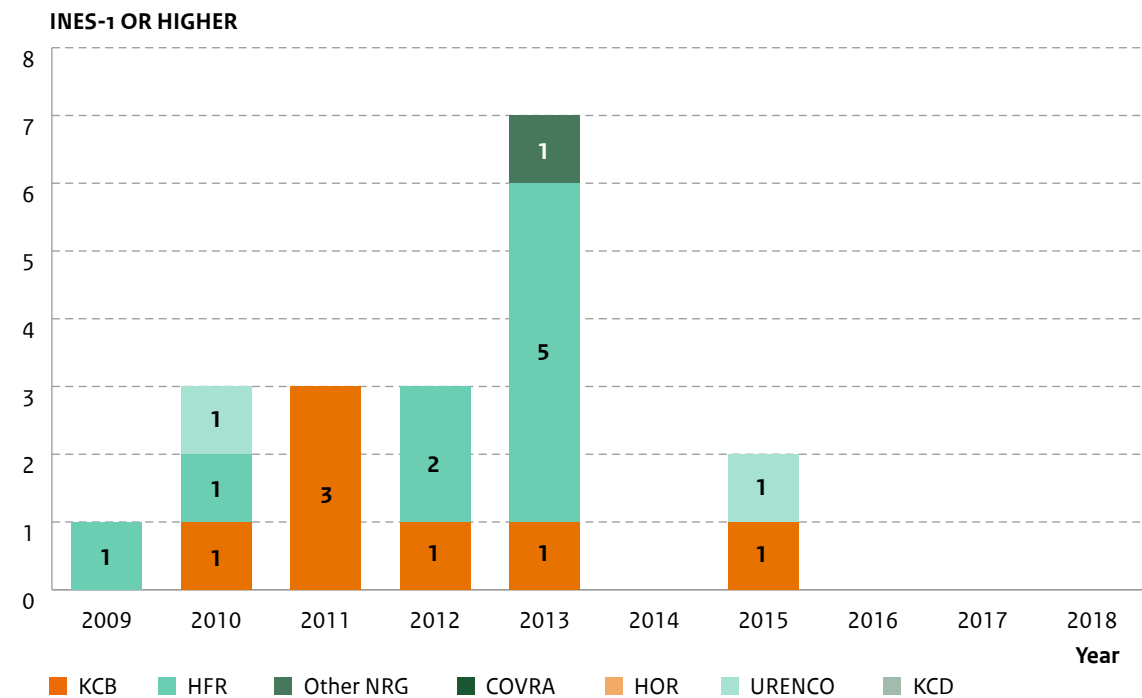


Figure 2: The number of compulsory notification events rated as INES-1 or higher, 2009 to 2018 inclusive. Two events at the HFR and one event at one of NRG's other facilities in 2013 were rated as INES 2; the other events were rated as INES 1.



⁴ In the past, other companies based at the Petten Research Centre (OLP) have been included in the report. However, the companies in question do not hold licences under Section 15 under b of the Nuclear Energy Act and are therefore no longer included

5 Conclusion

In 2018, the licensees of the various Dutch nuclear facilities notified the ANVS of a total of fourteen events. All the events were provisionally classified as minor anomalies with no safety repercussions, INES level 0.

The licensees analyse both compulsory notification events and other abnormal events with a view to identifying their direct and indirect causes. The licensees also consider what measures are necessary to reduce the likelihood of similar events occurring in the future. The ANVS supervises the licensees' activities to ensure that they satisfactorily fulfil their licence obligations.

On the basis of the information provided in licensee notifications and obtained on-site inspections, ANVS concludes that, in general, the licensees of the nuclear facilities tackled the events which occurred at their facilities in 2018 with due care. Nevertheless, the prompt and thorough investigation of events continues to require attention, the ANVS believes.

The ANVS considers that the licensees actively analyse events occurring at their facilities and make adequate use of event analysis findings, with a view to realizing improvements. The ANVS stays abreast of the progress and effectiveness of the measures taken, carries out on-site inspections and, where necessary, applies enforcement instruments to promote compliance.

The ANVS regards the event notifications received in 2018 as confirming the importance of ensuring that its supervisory activities continue to focus on the following: management of aging processes, knowledge of facilities, management of maintenance activities and management of change processes.

Annex A: INES event ratings

An assessment is made of the severity of all events that are subject to a notification requirement. Assessment is based on the International Nuclear and Radiological Event Scale (INES) defined by the International Atomic Energy Agency (IAEA) and the Organisation for Economic Cooperation and Development (OECD)'s Nuclear Energy Agency (NEA). INES ratings, from level 1 (anomaly) rising to level 7 (major accident), are used to make the level of events at nuclear facilities all over the world clear to the general public, in consistent terms. Events of INES level 2 or higher must be reported to the IAEA by the more than seventy countries which participate in INES.

The INES rating is the result of three separate ratings:

1. effects on humans and the living environment,
2. consequences for the facility, and
3. degradation of the system of layered safety provisions.

The ultimate rating of an event is based on the highest rating of the three.

Ratings of INES levels 0 to 3, inclusive, are given mainly on the basis of degradation of the system of layered safety provisions. Such degradation might involve, for example, the loss or partial loss of shielding resulting in elevated radiation levels, or the failure of one or more cooling systems, or the occurrence of (possibly severe) radioactive contamination within a facility. The four levels are defined as follows:

- **Level 0** is a 'minor anomaly with no safety repercussions'. In the context of INES, such events are also referred to as 'below scale': they do not qualify for rating on the main scale because their actual consequences (if any) are very minor and safety is not actually jeopardized. An INES-0 event can nevertheless be relevant to nuclear safety if, for example, it involves the unexpected activation of safety systems, or if one of the layered safety provisions was (partially) ineffective during the event.
- **Level 1** is an 'anomaly'. Level 1 anomalies are events in which, for example, problems arise with a facility's safety provisions, but where there are no (or only very limited) actual consequences and the remaining safety margin is sufficient to prevent exposure to radiation.
- **Level 2** is an 'incident'. Level 2 events are incidents involving more serious degradation of safety provisions, or with considerable potential consequences. The actual consequences of level 2 events for people and the living environment are limited, but they may involve elevated radiation levels or more severe radioactive contamination.
- **Level 3** is a 'severe incident'. Level 3 events are severe incidents where an accident is only just avoided and little or no safety margin remains. The actual consequences of such an incident may also be greater, but fall short of serious injury or the need to implement measures to protect the general public.

The assignment of higher INES ratings depends mainly on the occurrence of accidents, the consequences for people and the environment, and the consequences for the facility. Definitions of the higher INES levels are not provided here, because this report is concerned only with events, not with accidents or radiological emergencies. No events of INES level 3 or higher have ever occurred at Dutch nuclear facilities.

Events that are entirely irrelevant in the context of nuclear safety and radiation protection are not rated. Nor are they normally subject to a notification requirement under the terms of a Nuclear Energy Act licence. Where such events are nevertheless mentioned in this report or on the ANVS website, they are identified as outside the scope of the INES system.

More information about the INES scale can be found on the ANVS website (<http://www.autoriteitnvs.nl/onderwerpen/ines>) and that of the International Atomic Energy Agency (<https://www.iaea.org/sites/default/files/ines.pdf> and <http://www-pub.iaea.org/MTCD/Publications/PDF/INES2013web.pdf>)

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