



Authority for Nuclear Safety and
Radiation Protection

Report on events in Dutch nuclear facilities during 2019

Colophon

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Contents

Summary	4
1. Introduction	5
1.1 Events at nuclear facilities in the Netherlands	5
1.2 Events at nuclear facilities in other countries	6
2. Summary of events in 2019	7
2.1 Borssele Nuclear Power Plant (KCB), Borssele	7
2.2 High Flux Reactor (HFR), Petten	7
2.3 Other NRG facilities, Petten	8
2.4 Central Organisation for Radioactive Waste (COVRA), Nieuwdorp	8
2.5 Higher Education Reactor (HOR), Delft	8
2.6 URENCO Nederland, Almelo	8
2.7 Dodewaard Nuclear Power Plant (KCD), Dodewaard	8
3. Updated overview of events in 2018	9
3.1 Completeness of licensees' notifications to the ANVS	9
3.2 Updates to INES ratings (or preliminary INES ratings)	10
3.3 Updated overview of events in 2018	10
4. Evaluation	11
4.1 Individual facility evaluations	11
4.2 Notification trends 2010 to 2019	12
5. Conclusion	13
Annex A: INES event ratings	14

Summary

This report summarizes the events that are subject to a notification requirement that occurred at Dutch nuclear facilities in 2019¹. The requirement to draw up this report is laid down in the Nuclear Energy Act. Notification criteria are drawn up for each nuclear facility, specifying the events that have to be notified to the ANVS, and within what time frame. The ANVS also performs inspections to assess the licensees' overview of any internally recorded events. The purpose of such inspections is to verify that these recorded events are correctly resolved and that the licensee has learned the necessary lessons, and to ensure that all events that are subject to a notification requirement are indeed notified to the ANVS.

The ANVS publishes details of the event notifications it receives, on its website,² as soon as sufficient information about these events is available to provide a basis for a proper description. The ANVS endeavours to provide a clear, up-to-date summary of all events that are subject to a notification requirement, on its website (as referred to in this report).

In 2019, the licensees of the various nuclear facilities notified the ANVS of a total of eleven events. All the event notifications were classified as minor anomalies with no safety repercussions, INES level 0. In 2019, inspections of the facilities' internal event records for 2018 revealed no events that, in hindsight, were found to be subject to a notification requirement.

Based on the information provided in licensee notifications, in reports and obtained by on-site inspections, ANVS concludes that, in general, the licensees tackled the events which occurred at their facilities in 2019 with due care. Nevertheless, the ANVS feels that the prompt and thorough finalization of the investigation into these events is a key focal area. The ANVS feels that the event notifications received in 2019 confirm the importance of ensuring that its regulatory activities continue to focus on the following: ageing management, knowledge of facilities, management of maintenance work and management of change processes.

¹ Facilities with a Nuclear Energy Act licence in accordance with Section 15 (b).

² See www.ongewonegebeurtenissen.nl.

1. Introduction

As at any organization, 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 event. Internally recorded events (details of which are recorded in the databases) cover safety-related events and events that are of no safety significance, including events that are subject to a notification requirement. This report summarizes the events that are subject to a notification requirement that occurred at Dutch nuclear facilities in 2019. The ANVS performs random inspections of facilities' databases of internally recorded events to check that the licensee has learned the necessary lessons from these events. It also checks whether any events occurred that are subject to a notification requirement but were not notified to the Authority.

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 stipulated that the ANVS must submit annual event reports to the House of Representatives. The ANVS has prepared this report 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 must be notified of any events that are subject to the notification criteria. These notification criteria are laid down for each individual nuclear facility. They specify which events are subject to an ANVS notification requirement and the time frame within which such notification must take place. The length of the notification period depends on the nature of the event. In some cases, immediate notification is required, while in others notification must take place within four weeks. In 2019, with a view to enhancing the harmonization of the various nuclear facilities' notification criteria, the ANVS published the Notification Criteria Guidelines for Nuclear Facilities.³ The Guidelines are intended to help the licensees of nuclear facilities decide what must be notified to the ANVS, how this is to be done, 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 checks that the associated lessons and areas for improvement are correctly followed up.

The ANVS publishes details of the event notifications it receives, on its website. It does so when sufficient information about the event is available to formulate a comprehensive 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. In the case of various specific events, the ANVS will release information immediately. Details of events that impact the living environment, of safety-related events and events that may give rise to questions or cause concern among local residents or the general population are immediately published on the homepage of the ANVS website. Where necessary, Twitter is used to communicate such events to the public. This may also concern events that are not covered by the notification criteria. While these events are featured on the website, no further mention will be made of them in this report.

³ These were published on the ANVS website: <https://www.autoriteitnvs.nl/documenten/richtlijn/2019/05/22/handreiking-meldcriteria-nucleaire-inrichtingen>.

The ANVS also undertakes periodic inspections to assess licensees' overviews of internally recorded events. The purpose of such inspections is to verify that events are correctly resolved and that the licensee has learned the necessary lessons, and to ensure that all events that are subject to a notification requirement are indeed notified to the ANVS.

If an inspection yields novel information that warrants re-evaluation of an event, the information on the ANVS website will be modified and an update will be provided in the next annual event report. Hence, this report includes updates to the annual event report for 2018.

This report includes the notifications submitted by the following licensees, pursuant to Section 15 (b) of the Nuclear Energy Act:

- EPZ, licensee of the Borssele Nuclear Power Plant (KCB) at Borssele;
- the Nuclear Research and Consultancy Group (NRG) in Petten – a partnership of licensees – is responsible for the operation of the following facilities:
 - the High Flux Reactor (HFR),
 - the other facilities (NRG Laboratories).
- the Central Organisation for Radioactive Waste (COVRA) in Nieuwdorp;
- Delft University of Technology, 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 and stable isotopes (enrichment of elements other than uranium) in Almelo;
- the 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 outside the Netherlands. 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 actively informs the public about events that are relevant for nuclear safety or radiation protection and events at comparable nuclear facilities in Belgium and regions of Germany that border the Netherlands that are relevant from a communications viewpoint. Where necessary, Twitter is used to communicate such events to the public.

2. Summary of events in 2019

This chapter summarizes the events at Dutch nuclear facilities in 2019, concerning which the ANVS was notified by the relevant licensees pursuant to Section 15 (b) of the Nuclear Energy Act. The event notifications included in the summary concern events notified to the ANVS on the basis of the defined notification criteria. Table 1 shows the number of events that are subject to a notification requirement at each facility, rated by INES level.

Facility	Events in 2019 that are subject to a notification requirement	Consisting of:		
		INES level 0	INES level 1	INES level >1
Borssele Nuclear Power Plant (KCB), Borssele	1	1	0	0
High Flux Reactor (HFR), Petten	2	2	0	0
Other NRG facilities, Petten	7	7	0	0
Central Organisation for Radioactive Waste (COVRA), Nieuwdorp	1	1	0	0
Higher Education Reactor (HOR), Delft	0	0	0	0
URENCO Nederland, Almelo	0	0	0	0
Dodewaard Nuclear Power Plant (KCD), Dodewaard	0	0	0	0
Total for all nuclear facilities	11	11	0	0

Table 1. The total number of events that are subject to a notification requirement at each company in 2019, rated by INES level.

All events notified to the ANVS in 2019 were rated as INES 0. An event's rating can be increased to INES 1 if further investigation reveals that the event could potentially have had more severe consequences, that there is a systemic safety culture problem, or that the licensee has failed to learn the necessary lessons from previous events.

All events that are subject to a notification requirement, that occurred at each nuclear facility, are summarized in the following subsections. Details of each event are available in Dutch on the ANVS website. In addition, the website contains details of other events that are not included in this report. The ANVS endeavours to provide a clear, up-to-date summary of all event notifications on its website. The ANVS updates the event details on its website whenever relevant novel information becomes available, at the conclusion of an investigation, for example. For this reason, the full descriptions of these events are not included in the report. 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 2019, EPZ, the licensee of the Borssele Nuclear Power Plant, notified the ANVS of one event.

- 31 July 2019: Power failure due to transformer malfunction (INES level 0)

2.2 High Flux Reactor (HFR), Petten

In 2019, NRG, the operator of the High Flux Reactor, notified the ANVS of two events.

- 17 February 2019: Fission product monitor set to incorrect alarm level (INES level 0)
- 13 November 2019: Temporary anomaly minimum shift size (INES level 0)

2.3 Other NRG facilities⁴, Petten

In 2019, NRG notified the ANVS of seven events at its other facilities.

2.3.1 Molybdenum Production Facility (MPF)

- 16 May 2019: Pull pins present in Molybdenum Production Facility's gaseous fire suppression system (INES level 0)
- 21 August 2019: Molybdenum Production Facility's evacuation alarm unavailable (INES level 0)
- 30 October 2019: Reduced redundancy MPF building ventilation (INES level 0)

2.3.2 Hot Cell Laboratories (HCL)

- 8 February 2019: Fire dampers not closing during test (INES level 0)
- 19 September 2019: Ventilation failure Research Laboratories (INES level 0)

2.3.3 Jaap Goedkoop Laboratory (JGL)

- 22 January 2019: Unforeseen dispersal of radioactive material within the laboratory (INES level 0)

2.3.4 Decontamination and Waste Treatment Facility (DWT)

- 1 October 2019: DWT's emergency generator temporarily unavailable (INES level 0)

2.4 Central Organisation for Radioactive Waste (COVRA), Nieuwdorp

In 2019, COVRA notified the ANVS of one event.

- 26 March 2019: Damage to underground pipe (INES level 0)

2.5 Higher Education Reactor (HOR), Delft

In 2019, Delft University of Technology, the licensee of the Higher Education Reactor, did not notify the ANVS of any events.

2.6 URENCO Nederland, Almelo

In 2019, URENCO did not notify the ANVS of any events.

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 2019.

⁴ '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 2018

After the publication of an annual report, novel results, findings or insights may become available, such that the published summary of events no longer constitutes a complete and accurate picture of actual events. That can be the case, for example, following the conclusion of investigations still in progress at the time of publication, subsequent site inspections, or reassessment by the ANVS. This can mean that an INES rating is revised or that the stated number of events is no longer correct. This chapter describes these revisions. The ANVS endeavours to ensure that an up-to-date summary is always available on its website.

3.1 Completeness of licensees' notifications to the ANVS

Updates to the information regarding each facility presented in the event report for 2018 are provided below.

3.1.1 *Borssele Nuclear Power Plant (KCB), Borssele*

An inspection of Borssele nuclear power plant's internal event records, carried out in 2019, found no failure to notify the ANVS of any incidents that are subject to a notification requirement.

3.1.2 *High Flux Reactor (HFR), Petten*

The written summary of NRG HFR internal notifications found no failure to notify the ANVS of any incidents that are subject to a notification requirement.

3.1.3 *Other NRG facilities, Petten*

An inspection of internal event records, carried out in 2019, found no failure to notify the ANVS of any incidents that are subject to a notification requirement.

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 found no failure to notify the ANVS of any incidents that are subject to a notification requirement.

3.1.5 *Higher Education Reactor (HOR), Delft*

An inspection of HOR's internal event records, carried out in 2019, found no failure to notify the ANVS of any incidents that are subject to a notification requirement.

3.1.6 *URENCO Nederland, Almelo*

The 2019 inspection that was based on URENCO's biannual reports found no failure to notify the ANVS of any incidents that are subject to a notification requirement.

3.1.7 *Dodewaard Nuclear Power Plant (KCD), Dodewaard*

The Joint Nuclear Power Plant Nederland (GKN) was definitively shut down in March 1997 and has been in safe enclosure since 1 July 2005. Accordingly, routine inspections of internal event records are no longer carried out. The written quarterly reports in which relevant system and component anomalies are described found no failure to notify the ANVS of any incidents that are subject to a notification requirement.

3.2 Updates to INES ratings (or preliminary INES ratings)

In 2019, the investigations into a number of notifications dating from 2018 were concluded and assessed by the ANVS. Following an assessment of the final investigation report on an event, a final INES rating is assigned. Grounds for revision of the previously assigned INES rating (or preliminary INES rating) were identified in one case. The following explanation has also been published on the website.

Explanation of revised INES rating for notification from Borssele Nuclear Power Plant, 4 August 2018

During the past year, EPZ has investigated the underlying cause and potential impact of the notification concerning the automatic shutdown caused by a malfunction in the reactor safety system. This investigation has now been completed. Independently of this investigation, the ANVS has carried out its own technical and organizational investigation. The technical investigation focused on the reactor safety system and on the impact of the malfunction. The organizational research focused on the history, decision-making and interactions between EPZ and the ANVS, with the aim of continuing to learn and improve.

The reactor safety system is designed to deal with internal malfunctions effectively. The investigations performed by EPZ and the ANVS show that at no time during this event was the safety of the plant compromised. This was the basis for the original INES 0, a minor anomaly with no safety-related relevance.

The damage to the main coolant pump is the result of a design flaw in the reactor safety system. EPZ had been aware of this design flaw for over ten years, and had judged it to be of minor safety significance. That is why, for a long period of time, it was assigned a lower priority. EPZ decided to prioritize the safety improvements resulting from the post-Fukushima investigations and the 10-year Safety Evaluation. It did so in the knowledge that this design flaw could, potentially, have a major impact on the operation of the facility.

Given the lengthy period of time taken to correct the design flaw, the final rating of this event has been increased to INES 1. On the one hand, this indicates that this event is indeed a minor anomaly with no safety relevance. On the other hand, this event could have been prevented if the design flaw had been remedied sooner. Preventing adverse events is at the very heart of nuclear safety.

3.3 Updated overview of events in 2018

In the published report for 2018, the overview of events in that year has been revised to reflect the re-evaluations described in 3.1. In Table 2 you will find the revised overview for 2018.

Facility	Events in 2018 that are subject to a notification requirement		Consisting of:		
	Original number	Number after revision	INES level 0	INES level 1	INES level >1
Borssele Nuclear Power Plant (KCB), Borssele	7	7	6	1	0
High Flux Reactor (HFR), Petten	1	1	1	0	0
Other NRG facilities, Petten	4	4	4	0	0
Central Organisation for Radioactive Waste (COVRA), Nieuwdorp	0	0	0	0	0
Higher Education Reactor (HOR), Delft	1	1	1	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	14	14	13	1	0

Table 2. Revised total number of events that are subject to a notification requirement at each company, in 2018, rated by INES level.

4. Evaluation

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

- How are licensees dealing with events?
- Applying the principle of continuous improvement – learning from events.
- How are the measures devised in response to events being implemented?

In this chapter, the ANVS considers the questions above in relation to each facility and addresses some event reporting trends in the period from 2010 to 2019, inclusive.

4.1 Individual facility evaluations

The quality of the event resolution procedures at each facility is illustrated in the following summary, 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 one event in 2019, which was rated at INES level 0. EPZ submitted the event notification promptly. To this end, EPZ followed its own, well structured, internal process. EPZ's reports were of an appropriate quality. EPZ also demonstrated a willingness to learn from the events with a view to minimizing any risk of recurrence. Furthermore, EPZ responded appropriately to the ANVS's follow-up questions regarding the events and the investigations. EPZ displayed an open and constructive attitude while cooperating with the ANVS's investigation into the notification of 4 August 2018. See also subsection 3.2.

4.1.2 High Flux Reactor (HFR), Petten

NRG notified the ANVS of two events at the HFR in 2019. The HFR resolved the event notifications satisfactorily, in terms of quality and depth. The HFR has shown that it gives sufficient emphasis to continuous improvement by learning from events.

4.1.3 Other NRG facilities, Petten

In 2019, NRG notified the ANVS of seven events at its other facilities. None of the events qualified for a rating of INES 1 or higher. Although the quality of event resolution has improved, and communication between the ANVS and NRG is efficient, the internal management of the notification system and the speed of resolution are still key focal areas.

4.1.4 Central Organisation for Radioactive Waste (COVRA), Nieuwdorp

COVRA notified the ANVS of one event in 2019. On the basis of the quarterly reports and the findings of operational inspections, the ANVS finds COVRA's event recording and its application of the lessons learned to be satisfactory.

4.1.5 Higher Education Reactor (HOR), Delft

In 2019, Delft University of Technology did not notify the ANVS of any events. The inspection carried out in 2019 showed that internal notifications are properly recorded. During the resolution process, each notification is checked to identify the depth to which that event is resolved. It would be better if a carefully designed system were to be used for this purpose. The Reactor Institute Delft has been officially informed of this, as a key concern.

4.1.6 URENCO Nederland, Almelo

In 2019, URENCO did not notify the ANVS of any events. In its biannual reports, URENCO demonstrates that its event recording is satisfactory and that it is applying the lessons learned from any such events. These reports are complete and contain no safety-related events that are subject to an ANVS notification requirement.

4.1.7 Dodewaard Nuclear Power Plant (KCD), Dodewaard

In 2019, The Joint Nuclear Power Plant Nederland (GKN) did not notify the ANVS of any events. The quarterly reports show that GKN has followed up the other events with due care.

4.2 Notification trends 2010 to 2019

To give the public an indication of the severity of events, 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 the events rated as INES 1 and higher that have occurred at the various facilities in the Netherlands since 2010.

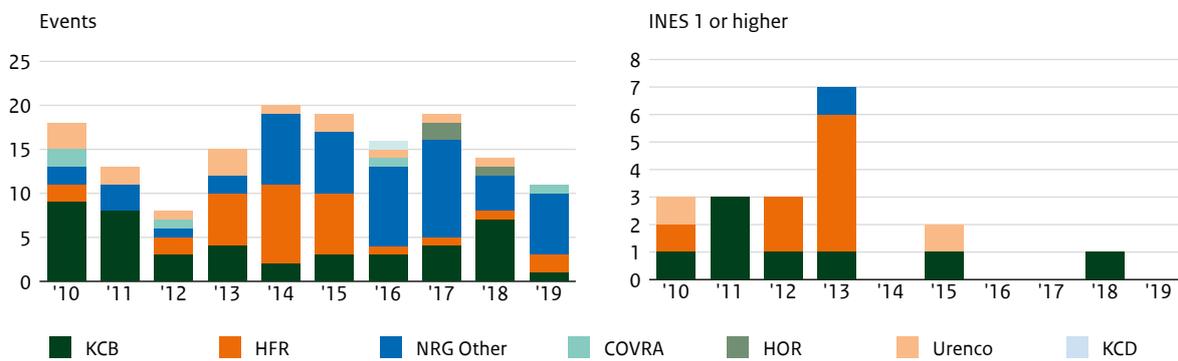


Figure 1 All events subject to a notification requirement in the period from 2010 up to and including 2019.

Figure 2 The number of events that are subject to a notification requirement and rated as INES 1 or higher, from 2010 up to and including 2019. Two events at the HFR and one event at one of NRG's other facilities

5. Conclusion

In 2019, the licensees of Dutch nuclear facilities notified the ANVS of a total of eleven events that are subject to a notification requirement. All the event notifications were classified as minor anomalies with no safety repercussions, INES level 0.

The licensees internally record events that are subject to a notification requirement and those that are not. Depending on their severity, events are analysed to identify their possible causes. These analyses lead to measures that can reduce the risk of recurrence or of similar events. The ANVS supervises the licensees' activities to ensure that they are satisfactorily fulfilling their licence obligations.

Based on the information provided in licensee notifications, in reports and obtained by on-site inspections, the ANVS concludes that, in general, the licensees of the nuclear facilities tackled the events that occurred at their facilities in 2019 with due care. Nevertheless, the ANVS feels that the prompt and thorough finalization of the analysis and investigation of these events is a key focal area. Accordingly, guidelines for this purpose have been included in the Notification Criteria Guidelines for Nuclear Facilities. The ANVS tracks the progress and effectiveness of the measures taken, by making enquiries, carrying out inspections and, where necessary, applying enforcement instruments to boost compliance.

The ANVS feels that the event notifications received in 2019 confirm the importance of ensuring that its regulatory activities continue to focus on the following: ageing management, knowledge of facilities, management of maintenance work 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 and that are relevant to nuclear safety and/or radiation safety. 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 (serious accident), are used to make the level of events at nuclear facilities all over the world clear to the general population, in consistent terms. The more than 70 countries that participate in INES are required to notify the IAEA about any events of INES Level 2 or higher.

The INES rating is the result of three separate ratings:

1. effects on humans and the living environment,
2. effects on 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.

Any events that are relevant to nuclear safety and/or radiation safety, but which fall below the lower threshold of Level 1, that have no actual safety impacts and that are below the lower limit of Level 1 with regard to the degradation of safety provisions, are referred to as 'below scale' or Level 0, a 'minor anomaly with no safety repercussions'. 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 or entirely ineffective during the event.

Ratings of INES levels 1 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 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 effects of Level 2 events on humans and the living environment are limited, but they may involve elevated radiation levels or more severe radioactive contamination.
- **Level 3** is a 'serious incident'. Level 3 events are severe incidents where an accident is only just avoided and little or no safety margin remains. The actual effects of such an incident may also be greater, but fall short of serious injury or the need to implement measures to protect the general population.

The assignment of higher INES ratings (4 to 7) depends mainly on the occurrence of nuclear or radiological accidents, the effects on humans and the environment, and the effects on 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 eligible for an INES rating. Where such events are nevertheless mentioned in this report or on the ANVS website (perhaps because they concern an environmental or occupational health & safety-related incident that is subject to a notification requirement or because they are being communicated due to the publicly noticeable impacts of an event) it is indicated that the INES rating does not apply.

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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