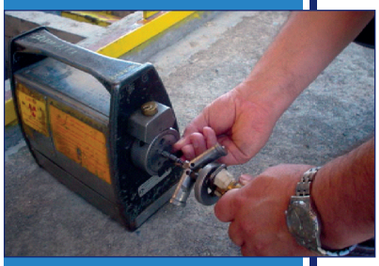


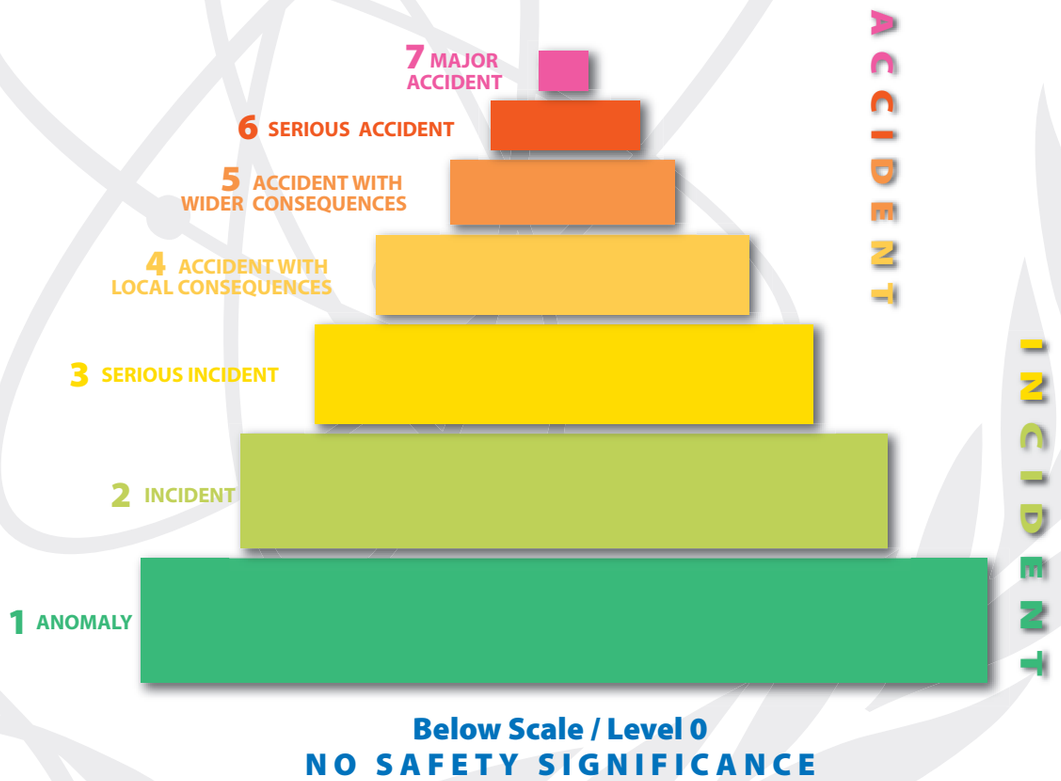
INES

THE INTERNATIONAL NUCLEAR AND RADIOLOGICAL EVENT SCALE

The INES Scale is a worldwide tool for communicating to the public in a consistent way the safety significance of nuclear and radiological events.

Just like information on earthquakes or temperature would be difficult to understand without the Richter or Celsius scales, the INES Scale explains the significance of events from a range of activities, including industrial and medical use of radiation sources, operations at nuclear facilities and transport of radioactive material.

Events are classified on the scale at seven levels: Levels 1–3 are called "incidents" and Levels 4–7 "accidents". The scale is designed so that the severity of an event is about ten times greater for each increase in level on the scale. Events without safety significance are called “deviations” and are classified Below Scale / Level 0.



IAEA
International Atomic Energy Agency
Atoms For Peace

OECD
Nuclear Energy Agency

For more information: *www-news.iaea.org*

INES classifies nuclear and radiological accidents and incidents by considering three areas of impact:

People and the Environment considers the radiation doses to people close to the location of the event and the widespread, unplanned release of radioactive material from an installation.

Radiological Barriers and Control covers events without any direct impact on people or the environment and only applies inside major facilities. It covers unplanned high radiation levels and spread of significant quantities of radioactive materials confined within the installation.

Defence-in-Depth also covers events without any direct impact on people or the environment, but for which the range of measures put in place to prevent accidents did not function as intended.

Communicating Events

Nuclear and radiological events are promptly communicated by the INES Member States, otherwise a confused understanding of the event may occur from media or from public speculation. In some situations, where not all the details of the event are known early on, a provisional rating may be issued. Later, a final rating is determined and any differences explained.

To facilitate international communications for events attracting wider interest, the IAEA maintains a web-based communications network that allows details of the event to immediately be made publicly available.

The two tables that follow show selected examples of historic events rated using the INES scale, ranging from a Level 1 anomaly to a Level 7 major accident; a much wider range of examples showing the rating methodology is provided in the INES Manual.

Scope of the Scale

INES applies to any event associated with the transport, storage and use of radioactive material and radiation sources, whether or not the event occurs at a facility. It covers a wide spectrum of practices, including industrial use

EXAMPLES OF EVENTS AT NUCLEAR FACILITIES

	People and Environment	Radiological Barriers and Control	Defence-in-Depth
7	*Chernobyl, 1986* — Widespread health and environmental effects. External release of a significant fraction of reactor core inventory.		
6	*Kyshtym, Russia, 1957* — Significant release of radioactive material to the environment from explosion of a high activity waste tank.		
5	*Windscale Pile, UK, 1957* — Release of radioactive material to the environment following a fire in a reactor core.	*Three Mile Island, USA, 1979* — Severe damage to the reactor core.	
4	*Tokaimura, Japan, 1999* — Fatal overexposures of workers following a criticality event at a nuclear facility.	*Saint Laurent des Eaux, France, 1980* — Melting of one channel of fuel in the reactor with no release outside the site.	
3	*No example available*	*Sellafield, UK, 2005* — Release of large quantity of radioactive material, contained within the installation.	*Vandellos, Spain, 1989* — Near accident caused by fire resulting in loss of safety systems at the nuclear power station.
2	*Atucha, Argentina, 2005* — Overexposure of a worker at a power reactor exceeding the annual limit.	*Cadarache, France, 1993* — Spread of contamination to an area not expected by design.	*Forsmark, Sweden, 2006* — Degraded safety functions for common cause failure in the emergency power supply system at nuclear power plant.
1			Breach of operating limits at a nuclear facility.

EXAMPLES OF EVENTS INVOLVING RADIATION SOURCE AND TRANSPORT

	People and Environment	Defence-in-Depth
7		
6		
5	*Goiânia, Brazil, 1987* — Four people died and six received doses of a few Gy from an abandoned and ruptured highly radioactive Cs-137 source.	
4	*Fleurus, Belgium, 2006* — Severe health effects for a worker at a commercial irradiation facility as a result of high doses of radiation.	
3	*Yanango, Peru, 1999* — Incident with radiography source resulting in severe radiation burns.	*Ikitelli, Turkey, 1999* — Loss of a highly radioactive Co-60 source.
2	*USA, 2005* — Overexposure of a radiographer exceeding the annual limit for radiation workers.	*France, 1995* — Failure of access controls systems at accelerator facility.
1		Theft of a moisture-density gauge.

such as radiography, use of radiation sources in hospitals, activity at nuclear facilities, and transport of radioactive material.

It also includes the loss or theft of radioactive sources or packages and the discovery of orphan sources, such as sources inadvertently transferred into the scrap metal trade.

When a device is used for medical purposes (e.g., radiodiagnosis or radiotherapy), INES is used for the rating of events resulting in actual exposure of workers and the public, or involving degradation of the device or deficiencies in the safety provisions. Currently, the scale does not cover the actual or potential consequences for patients exposed as part of a medical procedure.

The scale is only intended for use in civil (non-military) applications and only relates to the safety aspects of an event. INES is not intended for use in rating security-related events or malicious acts to deliberately expose people to radiation.

What the Scale is Not For

It is not appropriate to use INES to compare safety performance between facilities, organizations or countries. The statistically small numbers of events at Level 2 and above and the differences between countries for reporting more minor events to the public make it inappropriate to draw international comparisons.

History

Since 1990 the scale has been applied to classify events at nuclear power plants, then extended to enable it to be applied to all installations associated with the civil nuclear industry. By 2006, it had been adapted to meet the growing need for communication of the significance of all events associated with the transport, storage and use of radioactive material and radiation sources.

The IAEA has coordinated its development in cooperation with the OECD/NEA and with the support of more than 60 Member States through their officially designated INES National Officers.

The current version of the INES manual was adopted 1 July 2008. With this new edition, it is anticipated that INES will be widely used by the Members States and become the world-wide scale for putting into the proper perspective the safety significance of nuclear and radiation events.

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THE INTERNATIONAL NUCLEAR AND RADIOLOGICAL EVENT SCALE

GENERAL DESCRIPTION OF INES LEVELS

INES Level	People and Environment	Radiological Barriers and Control	Defence-in-Depth
Major Accident Level 7	• Major release of radioactive material with widespread health and environmental effects requiring implementation of planned and extended countermeasures.		
Serious Accident Level 6	• Significant release of radioactive material likely to require implementation of planned countermeasures.		
Accident with Wider Consequences Level 5	• Limited release of radioactive material likely to require implementation of some planned countermeasures. • Several deaths from radiation.	• Severe damage to reactor core. • Release of large quantities of radioactive material within an installation with a high probability of significant public exposure. This could arise from a major criticality accident or fire.	
Accident with Local Consequences Level 4	• Minor release of radioactive material unlikely to result in implementation of planned countermeasures other than local food controls. • At least one death from radiation.	• Fuel melt or damage to fuel resulting in more than 0.1% release of core inventory. • Release of significant quantities of radioactive material within an installation with a high probability of significant public exposure.	
Serious Incident Level 3	• Exposure in excess of ten times the statutory annual limit for workers. • Non-lethal deterministic health effect (e.g., burns) from radiation.	• Exposure rates of more than 1 Sv/hr in an operating area. • Severe contamination in an area not expected by design, with a low probability of significant public exposure.	• Near accident at a nuclear power plant with no safety provisions remaining. • Lost or stolen highly radioactive sealed source. • Misdelivered highly radioactive sealed source without adequate procedures in place to handle it.
Incident Level 2	• Exposure of a member of the public in excess of 10 mSv. • Exposure of a worker in excess of the statutory annual limits.	• Radiation levels in an operating area of more than 50 mSv/hr. • Significant contamination within the facility into an area not expected by design.	• Significant failures in safety provisions but with no actual consequences. • Found highly radioactive sealed orphan source, device or transport package with safety provisions intact. • Inadequate packaging of a highly radioactive sealed source.
Anomaly Level 1			• Overexposure of a member of the public in excess of statutory annual limits. • Minor problems with safety components with significant defence-in-depth remaining. • Low activity lost or stolen radioactive source, device or transport package.
NO SAFETY SIGNIFICANCE *(Below Scale/Level 0)*			

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